EXPLORING FOR PLANTS

DAVID FAIRCHILD

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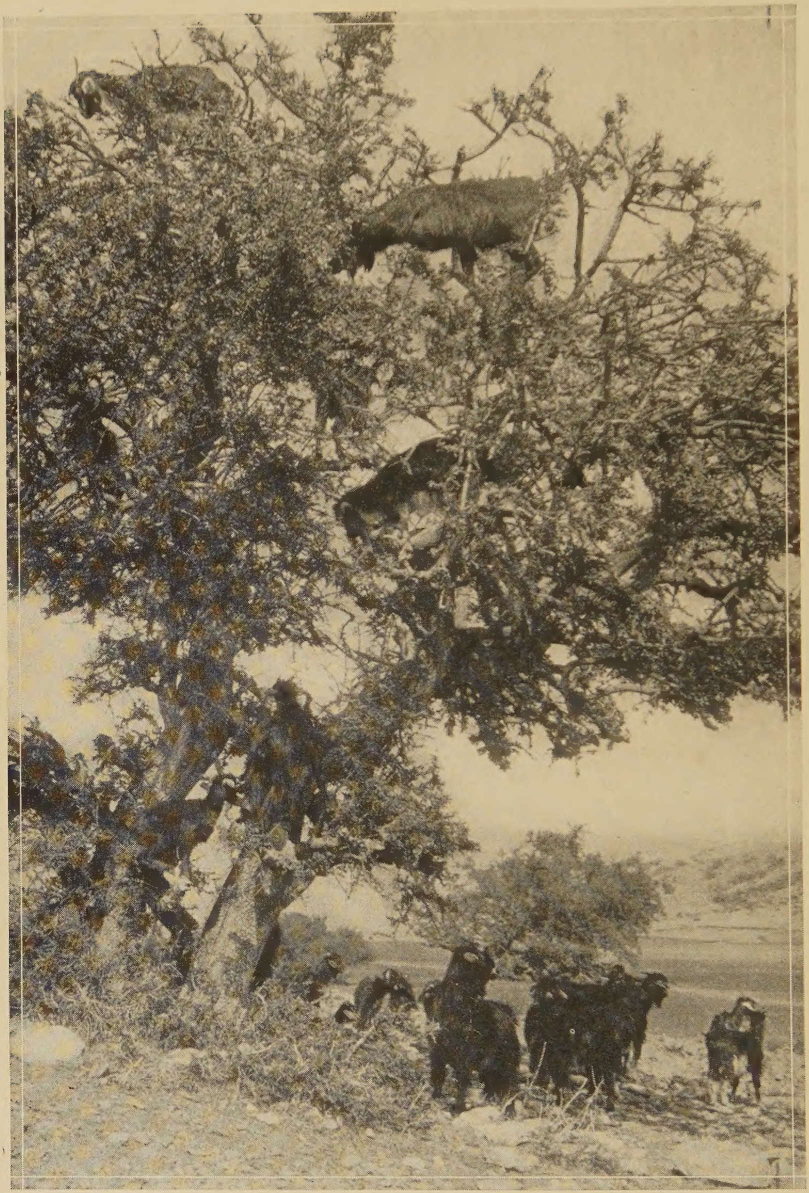

Many generations of goats have come and gone through this argan tree, making runways of the upper sides of the branches. The frequent footsteps of the goats cause the branches to flatten out, much as the grass under our tread makes a pathway of sod. It is a strange sight to see the goats silhouetted against the sky twenty feet or more above one's head in the topmost branches.

EXPLORING FOR PLANTS

BY

DAVID FAIRCHILD

From Notes of the Allison Vincent Armour Expeditions
for the United States Department of Agriculture,
1925, 1926, and 1927

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TO MY FRIEND

ALLISON VINCENT ARMOUR

WITHOUT WHOSE GENEROSITY, INITIATIVE, AND KINDNESS THE EVENTS DESCRIBED IN THIS BOOK WOULD NEVER HAVE COME TO PASS

INTRODUCTION

I AM conscious as I review this book, that it has attempted the impossible. It attempts to interest the layman with adventures that are not any of them hairbreadth escapes, and it seeks to give information about plants to the botanists and horticulturists in a popular form. The result will perhaps be to bring down on my head the criticism of my botanical friends, who will find some misspelled or obsolete scientific names, and of my lay friends who will think I have put in too many dry uninteresting Latin names which they cannot pronounce.

I am modest in my ambition with regard to its success, however, for I shall be content if a perusal of its pages shall convert a single person to the romantic life a deep study of plants can give. It makes no difference whether he or she should remain in one spot on the surface of the globe, exploring the inexhaustible resources of that particular place, or float about over its mountains and deserts searching from the air for forms which man shall in the years to come draw about his dooryard and make a part of the more beautiful environment of his life.

And in any case, this book does not constitute the only result of the years of travel and work which it describes; the really valuable results are growing up into trees and vines and useful plants, scattered from Panama to the Puget Sound. If any of them contributes a substantial benefit to the civilization of the coming centuries the efforts of those who contributed to the Allison V. Armour Expeditions, either in the field or as members of the staff of the Office of Foreign Plant Introduction of the United States Department of Agriculture, will not have been in vain.

I trust that my readers will realize as completely as I do that in a book of this kind, which describes very brief visits to great and complicated civilizations, any generalizations it contains are more in the nature of guesses than mature opinions formed after years of careful study. Whatever value they may have as historical statements, comes from the fact that they form a part of an accumulation of experiences stretching over a third of a century. One who has seen the same civilization many years before is in a different position from one who sees it for the first time.

I have tried to give as full credit as consistent with easy reading to all who contributed to the Expeditions abroad, but I wish here to emphasize the fact that behind and in support of the whole undertaking there has stood the Department of Agriculture with its Bureau of Plant Industry, of which the Office of Foreign Plant Introduction is a part. This Office of Foreign Plant Introduction, to whose building up and maintenance I have devoted the best years of my life, has furnished the funds and personnel to care for the thousands of new plants which the Expeditions brought to America.

Our collections, living and dried, now form a part of its equipment for the improvement of American agriculture. The seeds and plants have been received and carefully examined by the Experts of the Federal Horticultural Board, and later grown in the various Plant Introductions Gardens of the Department, and from them have been distributed to experimenters especially equipped to test them in various localities.

It is comparatively simple to collect a few plants and grow them in a single garden somewhere, but our work is to scatter them through the country in as many places as possible, with the idea that some of them may become a permanent part of American horticulture.

Much credit is due to the farseeing and liberal policy of the Chief of the Bureau of Plant Industry, Dr. W. A. Taylor, who saw in Mr. Armour's proposal an opportunity for coöperation which could not fail to be other than beneficial to the interests of American agriculture. The late Henry C. Wallace, then Secretary of Agriculture, and his successor, William M. Jardine, both gave to the Expeditions the support of their hearty approval.

It should be distinctly pointed out that the descriptions of the thousands of plants introduced have been recorded in the printed "Inventories of Plant Material Introduced by the Office of Foreign Plant Introduction," and constitute the formal report of the Expedition's activities. The general observations and incidents of travel recorded in this semipopular book are in no sense official. Also, the opinions expressed are mine alone; they cannot be taken as reflecting any official opinion whatever.

The expedition to West Africa was fortunate in securing the coöperation of the Royal Botanic Gardens of Kew. Dr. J. M. Dalziel was detailed to accompany us, and much of the success of that cruise was due to his knowledge of the flora of the region.

It was my desire that Mrs. Fairchild should join me as co-author of the book. She has dictated otherwise, but she cannot conceal the large part which she has played in the writing of it, although her name is not on the title page, it should be there. The book is peculiarly one in which the experiences and the work of both of us are portrayed.

As to the authorship of the illustrations, instead of giving to each one its author's name, I prefer to say here, in the introduction, that most of the small cuts were made from photographs of my own taking, but that in Ceylon, Sumatra, and Western Java, when my friends Howard Dorsett and his son Jim were with us, I found their technique and equipment so far superior to my own that I drew on their collection largely, particularly for the set pieces.

Finally I wish here to acknowledge the very material assistance in that important work of proofreading, given by my friend Robert C. Cook, Editor of the Journal of Heredity.

DAVID FAIRCHILD.

The Kampong, Coconut Grove, Florida.
February, 1930.

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EXPLORING FOR PLANTS

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CHAPTER I

FROM FLORIDA VIA PANAMA TO SWEDEN

SOME of the greatest things that have happened to me have happened on boats. It was on a boat off the coast of Malacca, one New Year's night that I promised Mr. Barbour Lathrop that I would devote my life to the introduction of useful plants into America. And it was on the houseboat of Mr. Allison V. Armour, anchored off the Brickell wharf in the Miami River, that I agreed that if he would buy a boat and equip it for the collecting of living plants, I would go with him on an expedition.

I had known Mr. Armour before he came to Miami. I had heard of his expedition through the West Indies with a staff of naturalists. His various expeditions to Cyrene and the archæological work he had made possible there and in Yucatan were known to me. I should have realized when, one night on his houseboat we planned an ideal trip to the marvelous and mysterious archipelago of the Moluccas that he was serious. The whole thing somehow seemed so much like a dream that when I spoke of it to my friends I think few of us thought of its ever coming to pass. This was in 1923. The following winter Mr. Armour came to Miami again and we discussed the expedition still further. I proposed the project to my Chief in Washington, Dr. W. A. Taylor, and, in a preliminary way, to the then Secretary of Agriculture, Mr. Wallace, both of whom entered into the plans with enthusiasm. And still I did not dare let my thoughts dwell on so wonderful a prospect for fear that something might happen and it would vanish, for the project depended upon the finding of the right boat which could be made over into a yacht suitable for Mr. Armour's purposes.

Things were in this nebulous state when I went down to Panama to spend a month on Barro Colorado Island accompanied by my son Graham and his friend Frederick Burgess. The Governor of the Canal Zone had set aside this island in Gatun Lake as a scientific wilderness, and I had joined with my friends Dr. William Morton Wheeler and Dr. Thomas Barbour in the erection of a little field laboratory in its fascinating jungles.

We were in this bewildering naturalists' paradise, having a most exciting time with its wild life, when one morning a cablegram came from Mr. Armour saying that he had bought the boat and was taking it to Sweden.

I cabled to Mrs. Fairchild, and to Mr. Armour, and broke the news to Graham, who, with his friend Frederick, had been swinging on the aerial hanging roots of some immense aroids that grew on the limbs of the giant forest trees beside the Laboratory. He didn't really know where the Moluccas were, though he surmised that they were in the tropics, and the exciting times we had been having in Panama had converted him to the joys of a tropical existence. A fer-de-lance had coiled up beside the improvised microscope table I had made below the laboratory, a gigantic tarantula had made us a visit one morning, and the experience we had had with stinging ants, swarming but stingless bees, howler monkeys, crocodiles, sloths, coati-mundis, and so on, had combined to make our stay in the island a thrilling one. Was it surprising then that the complete change of all his plans, even though it would break up all of his set school routine, failed to disturb him?

We began packing up, which always includes doing the various things one should have done before, and which, in this instance, meant the taking of large photographs of the courtship of the Calobata flies with a twenty-five-foot camera, a job that took the combined patience and profanity of the two boys and myself. It has been a satisfaction to see these photographs in Morton Wheeler's book, "Foibles of Insects and Men," which has just appeared.

Curt Richter had been on the island studying the astonishingly

Graham and Frederick preparing for a swing on the roots of some giant aroids in the jungle of Barro Colorado. If they had fallen into the spiny palms it would have taken a surgical operation to save them from blood poisoning.

slow movements of the sloth, and was continuing his work in the Phipps Psychiatric Institute in Johns Hopkins, and Graham was keen to take him a pet coati-mundi he had taken a fancy to. All of these things combined to delay our departure, but at last we were on the Caribbean, bound for Havana and the North, coati and all.

That remarkable investigator, Noguchi, came aboard at Havana, returning from Jamaica. He had filled the bathtub in his suite with a pretty flowered asclepiad (*Asclepias currasavica*) in which he was particularly interested, because of the fact that its latex was swarming with slender flagellated microscopic worms. I discovered that he was almost panic-stricken over the difficulties he would run into with the Federal Horticultural Board Inspectors in New York, and as I knew that the plant had already become common in the gardens of the South, I was able to offer him my assistance in clearing the plants into the country.

I got out my microscope and he showed us the flagellates in the latex, and also gave us a lucid account of his discovery of the germ which he believed causes Yellow Fever. It seems strange that before four years should pass, both he and I should visit the Gold Coast, and that he should die there, in Accra, of the fever he was sent to investigate. He was certainly one of the greatest Japanese of his time, and it was a privilege to have known him in this informal way.

It was late August when we steamed into New York, and the fifth of September, when, after a time so hectic that I shudder to recollect it, we pulled out of Washington in our Dodge Four Sedan, determined to take the car to Europe and load it on the yacht, despite the discouraging advice of nearly every friend who was asked. The family gathered at Montreal, Mrs. Fairchild and the two girls coming down from our country home in Baddeck, Nova Scotia, and there the great adventure began.

It is true that just as we had every detail worked out, and had burned our bridges, a cable came from Mr. Armour saying that the yacht would not be ready as soon as he had hoped, but I put the cablegram in my pocket and ignored it. I could not help thinking as I did so of an incident that had happened a few nights before our departure from Washington. I had been dining with our old friends, the Arthur Bullards, and late in the evening Herbert Hoover came in. He dropped wearily into an easy chair, as if he had just come from his office. Mr. Bullard said something to him about my going on a long plant hunting expedition. He looked up in a tired way and asked, "Does he have to make decisions on such a trip? If not, I'd like to go along. I'm tired of making decisions—one after another all day long. My view of Heaven is of a place where no one ever has to make a decision." I told Mr. Hoover that I thought travel did not take one away from decisions, but I was not half as positive about it then as I am now after three years of continual travel.

Yes, travel forces important decisions upon one at every instant of time. It is not the quiet, care-free existence the illustrated folders of Tourist Bureaus would lead one to believe, and I came to feel as the whirling weeks sped on, that the only philosophy a traveler can cling to must be Einsteinian in character, and whenever the worries of future plans beset us I remembered a remark of Morton Wheeler's, "So many things can happen before that time." Indeed, if to stay-at-homes life seems to be "just one damn thing after another," to travelers it is simply a kaleidoscopic mass of decisions made necessary by the swiftly shifting nature of one's environment.

We were a family of five, and a car, with a program that had been disarranged at the last moment; but we quickly decided to prepare for the Moluccas trip by study in the herbaria and laboratories and botanic gardens of Europe, where I had not been for twenty years, and, if possible, take our car across to Morocco, although this seemed then a remote possibility. In 1924 it was not the fashion to take one's car to Europe. The White Star Line had only taken two before and so great was the fear of the steamship officials that something would happen to the car that they boxed it, at my expense ($75.00), and had the courtesy to offer to keep the empty box at Liverpool indefinitely, in case I should want it for the return journey.

It was already autumn when we left Montreal, and the cold winds were whistling about the tall buildings as we set sail for Liverpool, bag and baggage.

To revisit a continent after sixteen years, during which time one has grown from youth to middle age, and has acquired a family, is pretty much like visiting it for the first time, and when we landed in Liverpool and went to Chester, as I had done once before, I was struck by the fact that I remembered so little of it. I had forgotten, for example, that nobody in England drinks water at breakfast. I had quite forgotten too, that the amount of silver scattered about one's plate in an English hotel is much greater than in America. It is true that I did remember, although faintly, that one always has boiled potatoes in England and that nobody ever seems to eat them baked, but somehow I had forgotten how fixed and set the average Englishman is in the matter of his food. I was reminded of this the day after landing. I was traveling to Newcastle to take a North Sea steamer to Sweden to join Mr. Armour and see the freight boat he was remodeling at Gothenburg into what became the charming yacht "Utowana." My seat mate on the train was a typical burly business man of the confident British type, and after listening to my suggestion that gradually the tropics would supply more and more of the foodstuffs consumed by the British public, he said impatiently, "There's naught so queer as folks. Oh! I don't think it will. Our people want to sit down to a breakfast of bacon and eggs. I don't think they will ever be satisfied with cereals and fruit."

This brusque remark of a stranger reminded me afresh of the curiously local character of taste. Throughout the whole three years of wandering, my eyes have been more or less alert to the passing show of foods which have been offered to me on the tables of the countries through which we have traveled and if there is any one "golden thread" to this narrative, it is the thread of the food habits of the world. It was, I think, this feature of my work for the Department of Agriculture, growing out of the search for new plants for introduction into America, that first attracted Mr. Armour's attention, and through the whole period of our travels in his yacht, his wide knowledge of European and American food habits was a never-ending source of entertainment and instruction to me. His sane judgments, born of long experience among the epicures of both continents, checked many of my wilder generalizations made from the more meager data of my own experience.

I am not a particularly good sailor and I realized how lacking in spirit I was when I boarded the tiny little boat at Newcastle in which I was to cross the North Sea in a storm. The sight of Newcastle itself, particularly on a rainy autumn day, is enough to send a shudder through the frame of anyone who loves sunshine and warmth. If the ghosts of any prehistoric men are daring enough to leave the forest haunts where their earthly bodies wandered, and gaze down on the cranes and furnaces of Newcastle, they must say to themselves, "What a mess of life this new offshoot from the anthropoid tree has made. He has built great hives and immense structures, but look at the individuals! What tiresome existences they lead! Not one of them, even for an instant, appears to be his own master. I would never have dreamed that any kin of mine could adapt his existence to such a level as that of Newcastle." The Newcastle workman might reply that it was true that he had little freedom, but that he had warm clothes, dry houses to live in, abundant food, and a host of other advantages—forgetting, perhaps, that the prehistoric anthropoid was wondering why in the name of common sense anyone should choose to live in such a raw and inhospitable spot where such things as houses are necessary, when he might roam the tree-top forests of the warm tropics.

In spite of my forebodings, the crossing of the North Sea was quite comfortable, the Captain was a congenial soul, who was fond of flowers, and in twenty-four hours we were in Gothenburg.

I had never been on a metal boat when it was being remodeled, and I am frank to say, I never want to be again, for of all the horrible noise and din, I never heard the like. It was worse than the Chinese Christmas I once lived through in Java when bombs were bursting under our veranda throughout the night.

To walk over such a frightful mess of steel and paint and grease and try to plan with my friend where the plant cases should be put, was an entirely new botanical experience. I could no more visualize the vessel which was to take us to the Moluccas, than a child who has never seen a lily, could imagine what one would look like by examining a bulb. But I did learn something botanical, or rather horticultural, in Gothenburg, when trying to outfit the yacht for its collecting trip. I learned that the flowerpots in Sweden are mostly handmade and that the gardeners much prefer these more porous pots to the machine-made ones such as are in universal use in America. Is this just a superstition, I wonder? Have any accurate pot experiments been made to prove it scientifically?

Then I also learned that although in America one can buy at any florist shop sphagnum moss of a more or less uniform character, in Sweden one has to arrange to have it especially collected from the sphagnum bogs. There is no such thing as a bale of sphagnum moss in Sweden, any more than there is to be found thick glass with wire molded into it, such as one needs for a wardian case in which to ship plants.

I had visited Gothenburg many years before and had been particularly interested in a charming botanical garden run by the Gothenburg Horticultural Society. I was much pleased to find this "Trädgården" more beautiful and prosperous than ever, with grounds which put to shame any of the formal parks of Washington, and greenhouses which surpass any of those Con-

The yacht "Utowana" photographed on her cruise up the Gambia River. She was equipped with a laboratory and library and had special facilities for collecting and drying seeds as well as for the transportation of living plants.

gress has provided for the visitors to the Capital. There are no stockholders in the Gothenburg Horticultural Society. The money made from admissions goes back into the maintenance of the garden, and the director, Mr. Hjelm, told me that the $56,000 so raised is ample for all its needs. It made me wonder whether there is not something of an illusion in the idea that the management of all city parks should be tied up to the politics of the city. Why could not a society of business men and women try the experiment of making one of the parks in each of our cities really superbly beautiful and get its support from the charges for admission into it? At the Trädgården in Gothenburg there has also been built up a remarkable seed and nursery business, through which visitors can buy any of the species they have noticed in the park. To the layman who visits our botanic gardens and public parks in America, there must always be something annoying in the fact that although he may see a beautiful species of plant and covet it for his garden, he cannot buy it while he is in the mood for doing so. He cannot even leave an order for it at the gate. He sees it, perhaps writes down the name, and proceeds to forget to look it up in some nurseryman's catalogue. The years pass by and he never does get it.

On my return to London I realized that although I had been there many times before, to be there with a family and a Dodge car made an entirely new place of it, and I thoroughly enjoyed it.

Finding your way about London in your own car is no more difficult, I should say, than to find your way around Boston, but it is much slower going. When I compare the experience of driving forty miles an hour right into the heart of San Francisco or Philadelphia over roadways carrying four cars abreast, with what one has to do in London or anywhere else in Europe, for that matter, I cannot help feeling the gulf which divides the old world from the new.

I was arrested by two Bobbies on Piccadilly Circus all on account of having a bumper! In 1924 there were no bumpers to speak of in London, or so I should judge from the fact that these two policemen and the Solicitor of the Royal Automobile Club, to whom these polite keepers of the traffic referred me, seemed never to have seen one. The license tag which the Royal Automobile Club of Liverpool had put on the car hung so low that the bumper obscured it at the prescribed distance of three paces and for this sin, as well as for the unwitting concealment of the foreigner's poster, I have a long letter from that ancient organization called Scotland Yard.

The courtesies which the London Bobbies showed us at all times, even to the extent of getting on the running board and piloting us to our hotel through a dense fog, have affected my feelings toward every citizen in Great Britain. I wish that more of us were aware of the crime of stationing men with short tempers and rough manners where tourists gather, instead of putting in such positions officers like the London Bobbies, skilled in the quiet art of pacifying irate, excited men and women who are harassed by the traffic.

CHAPTER II

ENGLAND'S GREAT GARDEN AND ARBORETUM

Kew might be called the botanical Mecca of the English-speaking world. Like so many of the interesting things in England it has been built up by a long and distinguished line of really great men, the greatest of whom was doubtless Sir Joseph Hooker whose vision included not only the desirability of a classification of the plants of the world, but such far sighted plans as the establishment in the Orient of the best species of rubber-producing trees from the Western Hemisphere. To his stimulating encouragement was due the introduction of the Para rubber tree (*Hevea braziliensis*) from the valley of the Amazon to the hills and valleys of the Malay Peninsula, Ceylon, Sumatra, and Java, which made possible the establishment of the huge rubber plantations of the Oriental tropics. If one would have a glimpse of the personality of this great man let him read the letters of Asa Gray and catch from them some of the enthusiasm he felt when he first met Hooker in London.

It was with the feeling of awe which I imagine most botanists experience when they approach the confines of these famous Kew Gardens, that Graham and I pulled up at the Lion Gate entrance on a beautiful morning in October. The American hickories were as golden yellow as they are in Maryland and while the maples did not seem as scarlet as they are with us, I was surprised to find as much autumn coloration as we did. There is not much vivid color in the landscape of England, but in Kew the trees and shrubs from every corner of the known temperate regions of the globe seem to be about as gay as they are in their own homes.

How can I describe or give any idea of a two weeks stay at the

Kew Herbarium? To one interested in getting an idea of the vast variety of plant forms which inhabit the planet, it is a most amazing place. Sit if you will for hours on a wooden stool before a plain deal table in one of the alcoves between the stacks of dried plants, and turn over the blank leaves between which are kept the dried specimens which through the decades have been sent in by botanical collectors from all over the world! If you have any imagination you can see in these herbarium specimens a deep significance and a real romance beside which the exciting stories of personal adventure seem rather futile. Nothing now is left of the adventure but the account in words, while here you are looking at the actual thing the collector gathered and dried, a thing which he believed would add its mite to the structure of human knowledge. To those who hurry through life the hundreds of cases in the Kew Herbarium contain only so much dried plant material, mummies having little relation to the actual plants, fragments of flowers and leaves, brown with age and often falling to pieces. Such as these do not realize, I think, that although you can describe a plant species in words, if you are clever enough, it is vastly more difficult to tell from the verbal description whether some plant which you have in your hand is that plant or not, than it is to turn to a dried specimen of it in a herbarium and compare its form with the one you have.

I had a definite object in visiting the Kew Herbarium. I wanted to find out all I could about the relatives of the famous tropical mangosteen with which I had first become acquainted in Java in 1895, and whose introduction into south Florida, Porto Rico, Hawaii, Honduras and Panama, I had repeatedly but not too successfully attempted. The genus Garcinia to which the mangosteen belongs, I knew to be a rather large one, but since I had never had access to much tropical botanical literature and had never seen the herbarium material of the genus, I was curious to learn more of the relatives of the so-called "Queen of Tropical Fruits." I thought that perhaps some of these relatives would prove good stocks

The mangosteen, "queen of tropical fruits," which will in a few years appear on American tables.

upon which to graft the mangosteen as it has the reputation of being extremely difficult to grow.

So day after day I examined the specimens in the Kew Herbarium, where a strange but fascinating stillness reigned, in spite of the fact that scattered about through the various alcoves, were many botanists shuffling herbarium sheets.

I found there were many more species of garcinias bearing good sized fruits than I had imagined. The genus is a large one, containing more than one hundred and fifty species, or fifteen times as many as does the genus citrus to which the orange belongs, while the genera to which the pear, apple, peach, cherry, grape, melon, and apricot belong, are tiny in comparison. Yet of all these species of garcinia, scarcely a dozen are utilized by man, and not even the first step has been made toward their domestication and the improvement of their fruits through breeding or selection. Yet viewed from the standpoint of beauty alone I doubt if there is to be found a genus of trees with more beautiful evergreen foliage, shapelier form or more attractive appearance.

As I pored over the herbarium sheets there opened before me, in my imagination, two worlds. There was the world of the dried specimens, in the study of which I soon saw I could spend years of my life if I were interested in classifying them, becoming more and more critical as the years passed and the individual specimens became a veritable part of my existence. I used to wonder how it was possible for people to play indefinitely with a pack of fifty-two cards, but when I came to realize that the combinations are as many and as varied as are the waves which for countless ages have broken on my sand spit here on the Bras d'Or lakes, without once producing a duplicate, I became more charitable. The world of botanical specimens partakes of the world of cards in that there is endless variety possible in the arrangement of the species to show their relationships. There is however a great difference in object. The card player works with endless combinations and then throws away the cards, whereas the botanist works with his specimens and leaves them arranged for the following generation. If he has arranged them well his classification lasts for centuries; if not, some other botanist rearranges the specimens.

But the other world, and the one which has more attraction for me than the world of the herbarium, interesting though that be, is the world of the living garcinia trees that I could imagine growing in all parts of the Orient. I wanted to gather their seeds and grow them and set them out somewhere in the Western Hemisphere where they are, with few exceptions, utterly unknown. For this purpose I gathered with great care all the data I could from these herbarium sheets, which are the original sources of information as to just where a species is growing, at what season it is in fruit, and so on.

I became more and more interested in this Garcinia genus which stretches its species from West Africa across the whole of tropical Asia on through to the Fiji Islands. I found it was named after Laurent Garcin, a Frenchman, born at Grenoble in 1683, who, with his father, left France at the time of the Edict of Nantes and settled in Vevey, Switzerland. As a boy he was so "stupid," according to his father's way of thinking, that he was given up as hopeless. Nevertheless he became a distinguished poet and preacher and later, as physician in the Dutch army, traveled extensively in the East Indies collecting plants as a hobby. Linnæus, in naming the genus after him, has preserved his name from extinction and in his "Philosophie Botanique" points out how true it is that often the chief recompense of the botanical collector is the immortality accorded him by naming a plant after him.[1]

But how much easier it is to sit before the dried material and plan for the collection of seeds of this or that species than it is to get the living seeds into your hand. When I studied the labels and looked up in the atlas the localities which the collector had given, half the time I could not find them, for an ordinary atlas does not often condescend to mention such places as Gunong, Bubu, Kota Tingi or Dink, and I had to search out more detailed, large-scale maps. Gradually it was borne in on me what a herculean task it would be to get even a majority of the hundred and fifty species together. More than three-fourths of them are jungle trees scattered here and there through almost impenetrable fever-infested forests, and one would have to spend years at the undertaking. It is comparatively simple to get the leaves of some rare forest tree growing in the jungle, but to get seeds when they are in just the right condition, means months of waiting and repeated expeditions, for the "jungle folk" are watching the trees too, and they often gather the fruits and scatter the seeds, so that when the collector returns to the tree he has marked, it is only to find it bare of fruits and he must wait another year for the next crop.

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[1] Il faut garder avec respect les noms des genres destinés à conserver la memoire des botanistes qui ont bien merité de la science; c'est la plus belle ou plutôt l'unique recompense de leurs travaux; mais il faut decerner sobrement ces honneurs botaniques.

Of course there are people living in the regions where the garcinias grow but it would be hopeless to write and expect any results. Not one in a million of them would lift a finger to get you the seeds even though he did know where to find them. Generally he would not have the faintest idea of what your letter to him was about, while, if he should happen to collect the seeds the chances are he would not know how to pack them so that they would reach America alive.

So, after two weeks in the herbarium, during which time I had looked at every species of garcinia there, I realized that the collecting of all the garcinias of the Orient would be entirely too big an undertaking for any single expedition to tackle. It would take a man a lifetime and cost hundreds of thousands of dollars. When our expedition finally succeeded in collecting eleven of the one hundred and fifty species I felt that we had done very well.

Just as I was closing my work at Kew, the Director, Dr. Hill, asked me to tea and surprised me by placing in my hands a small box of fresh mangosteens which had been sent him from Trinidad.

It was curious that just as I was studying the garcinias in the herbarium, these fruits of *Garcinia mangostana* should arrive. Dr. Hill asked me what we would do in Washington to popularize such a fruit as the mangosteen, and when I told him that as a starter we were in the habit of sending our new fruits to the White House for the President to taste, he turned to one of his assistants and remarked: "Do you suppose we should ever hear from a new fruit if we sent it to the King or to the Prime Minister?" Just why he should think it beneath the notice of the King to taste this new fruit, I cannot understand, for the King's grandmother, Queen Victoria, once offered a hundred pounds to anyone who would bring her one. Within sight of where we were sitting, the Duke of Northumberland once grew two mangosteen trees in his great conservatory at Syon House and matured a fruit on each tree. One he presented to Queen Victoria, and he held a banquet in honor of the other one, after which performances he cut the trees down. Perhaps the Queen did not give him the £100, I do not know. At any rate all this happened in 1855, nearly three quarters of a century ago, and since then little has been done to bring this marvelous fruit into production. Probably the distance from a market has been the chief trouble. I have hoped that in the Western Hemisphere where its culture would be on lands near enough to a great market to make something out of it, its future would be brighter.[1]

We found ourselves at Kew among a most interesting group of systematic botanists, most of whom were working on the floras of different regions of the globe. There was Burtt Davy, buried among the plants of South Africa; and Foxworthy writing up the trees of the Malay Peninsula, of which there are more species, twice over, than there are flowering plants in the British Isles; and the Emeritus Director of Kew, Stapf, who is struggling to finish his description of the grasses of Africa; and Ridley, that veteran of Plant Introduction, whose keen intelligence and persistence had so much to do with the establishment of the Rubber Industry in the Orient, hard at work finishing his flora of the Malay Peninsula. Among the younger men, was Hutchinson, surrounded by hundreds of remarkable sketches in black and white which are to illustrate his new "Families of Flowering Plants," and working with him on a new Flora of West Africa was Dalziel who, after eighteen years as Medical Officer in Nigeria, during which he collected every plant he could lay his hands on, as a hobby, has settled down to the work he loves at Kew. I little dreamed when I first met Dalziel how close our relations were to be later on in the Kameroons and on the Gold Coast.

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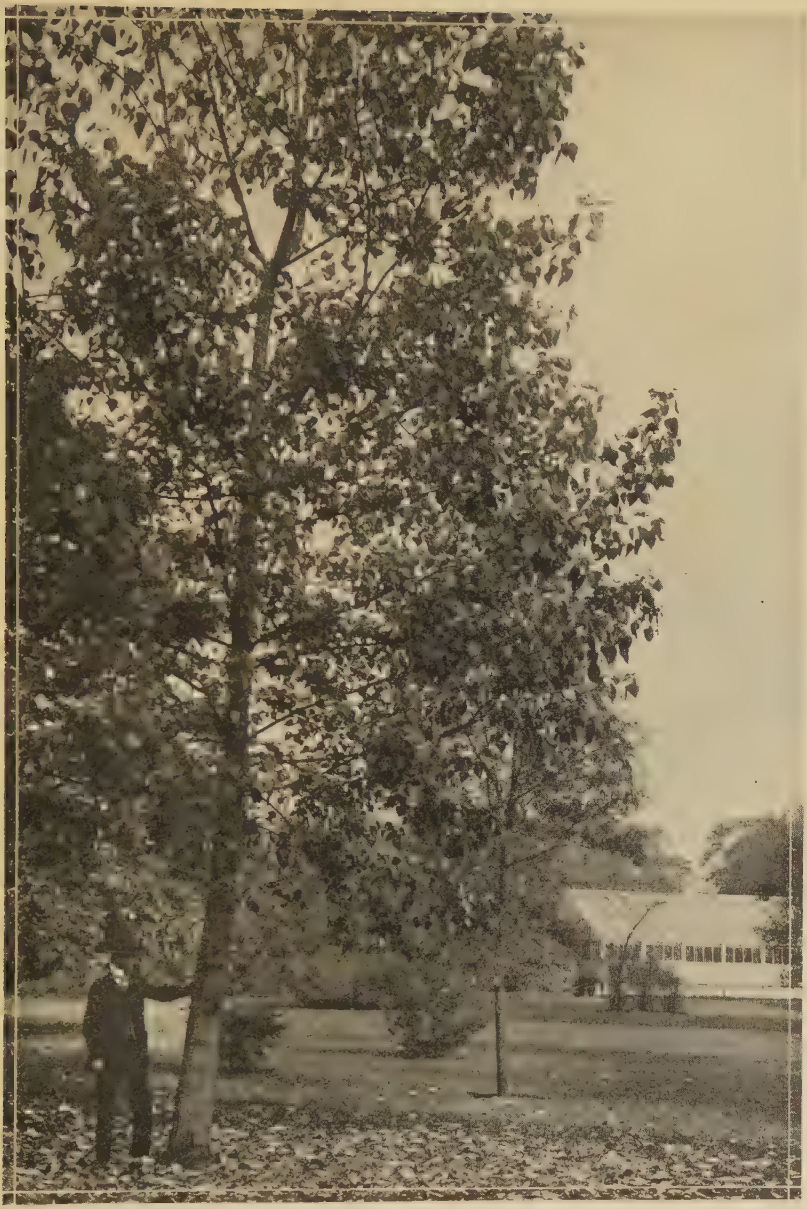
[1] Wilson Popenoe, my former associate, informs me that he now has 500 young mangosteen trees growing in the United Fruit Company's garden at Tela, Honduras, and in Panama, after many attempts, a small orchard has been established at Summit.

Kew has another and to me quite as fascinating a side—that of the arboretum of over two hundred acres in which the herbarium and other museum and administration buildings are placed. In charge of the arboretum is the veteran arboriculturist, Bean, author of one of the most useful books ever written, "The Trees Introduced and Native of Great Britain." To walk around Kew with him and hear his comments on every one of the species of tree or shrub tucked away in the crowded borders around the soft velvety lawns is an education in itself.

It is difficult for an American to orient himself as to the climate of Great Britain. He is so apt to think that because it lies across the Atlantic from Labrador it is, let us say, at least as cold as Maryland, while in reality it has not as severe winters as the Carolinas. Certain species of eucalypts are growing in western Scotland, that cannot be grown north of Florida on our Atlantic coast. There are even spots where the thermometer does not go lower than it does in Miami. When he sees how luxuriantly the roses grow in Britain he thinks it must be as rainy as New England, but its average rainfall is less than in many of the so-called dry-land regions of America, only twenty inches or thereabouts. Indeed a rainfall as low as eleven inches for the whole year has been recorded. I have seen in a single downpour in Florida, half as much rain as reaches the ground during the whole year of fogs and mists and drizzles in England. One sees no erosion to speak of in England, and wonders at it, but there is too little rainfall to wash the earth away. Paradoxes strike one on every side at Kew. For example, the North American pawpaw (*Asimina triloba*), which we associate in our minds with the hot summers of Virginia, Ohio, and Maryland, is growing and fruiting at Kew, and yet the Japanese honeysuckle (*Lonicera japonica*) which grows so rampantly around Washington as to be a veritable pest, seems to have hard work to keep alive. The *Araucaria araucana,* K. Koch, the monkey-puzzle tree of Chile, grows splendidly at Kew but is tender in the Carolinas and Georgia. One thinks of it as a wet-land tree but as a matter of fact it grows in the dry hills of southern Chile. This accounts, perhaps, for the fact that it can grow in the countries of light rainfall like England and Norway and the foothills of the Sierras in California, where the winters are not very cold, but that it dies in the regions of wet, hot summers such as Florida.

We have taken so much of our ornamental horticulture from England that it is time to study more closely the great differences in climate between any part of the United States and the British Isles. There is really only one part of the American Continent which even remotely resembles in climate that of Great Britain and that is the Puget Sound region. Already on Vancouver Island one sees flower borders of delphiniums and oriental poppies, veronicas and lilies, and arbors of climbing roses rivaling any to be found in England. British gardeners from Kew who live there, declare that it has as perfect a gardening climate as that of Devon.

To give a list of the plants which interested me in the Arboretum of Kew would be to make a catalogue, but there are certain species which, because I coveted them for my own country, I shall mention. I saw for the first time the strange *Davidia vilmoriniana* in full fruit, and thanks to Dr. Hill's generosity, seeds from these



A rapidly growing hybrid poplar (*Populus generosa*) in Kew Gardens, England, only thirteen years old. It gives promise of being a valuable new producer of soft wood and paper pulp.

are growing into trees in America. I am getting impatient to see in our Washington parks this splendid tree with great white bracts which E. H. Wilson, who first collected it in China, once told me could be seen a half a mile away across the valley. It is now a quarter of a century since it was introduced into America. Its failure to be widely planted here is a long story.

Two new hybrid poplars fired my imagination, for I have always believed that Prof. Sargent was right in urging foresters to take up the matter of breeding forest trees. *Populus generosa*, one of Augustine Henry's species, is the direct result of a cross pollination made in 1912 between *Populus angulata* var. *cordata*. Simon-Louis and *Populus tricocarpa*, Torr & Gray, and has made a tree of remarkable size in the arboretum in thirteen years. Three years later I was delighted to find a young plant of this hybrid, growing splendidly on the bleak plains of North Dakota at Mandan, from cuttings sent in from Kew. Since the staminate parent *P. angulata* var. *cordata,* is said to be hardier than the type, this hybrid may survive the extreme cold of the great plains and become a very valuable tree. *Populus eugenei,* supposedly a hybrid between *Populus nigra* var. *italica,* Dur. the Lombardy Poplar and *Populus canadensis* var. *serotina* or *P. marylandica,* has made a record of ninety feet in thirty-five years on poor soils. The original specimen in Simon-Louis' nursery at Plantieres near Metz is one hundred and fifty feet high and has a girth of twenty-five feet. There would seem to be a great future, as Stout of the New York Botanic Garden is so convincingly proving, in the breeding of poplars for paper pulp, and matchwoods, and who knows what other purposes, now that the chemical industries have taken to tearing the cells of the woods apart and cementing them together again in all sorts of new combinations.

One of E. H. Wilson's West Chinese brambles struck my particular fancy, *Rubus thibetanus*, Franch, with its upright form and beautiful foliage, silvery pubescent below. It should be utilized as an Ornamental shrub in America, in fact not half enough attention has been paid to the Oriental species of brambles with a view to their improvement and domestication in America.

To see five species of Nothofagus, the so-called Antarctic Beeches, reminding one in a striking way of our own beech, and to realize that nowhere in America have these been grown successfully, served to emphasize the fact that we have not yet more than begun the testing of the strange and interesting trees of the world. It also recalled to mind the curious fact that, although inhabitants of the Antarctic, these trees cannot stand much cold.

The Generosa hybrid poplar, showing its hardiness on the plains of the Dakotas. The hybrid poplars which Dr. Stout has produced may play an important part in the paper pulp problem of the future.

That strange Chinese representative of our tulip poplar, which Wilson found in China, the only other species of this remarkable genus *Liriodendron* known on the globe, but which somehow seems to dislike the American climate, was represented by a fine specimen at Kew. It takes an expert to distinguish it from the American species and is a striking instance, as I take it, of the distribution of plants across the Arctic in those times when the climate was mild enough for figs and sassafras and our tulip tree to grow there.

If the urge to move on and visit the Continent again after twenty-two years had not been enough to bring my stay at Kew to a close, the cold, damp weather would have been. Graham and I had come almost directly from the Canal Zone, and when one night in the hotel I heard a curious racket behind me and turning around saw Graham chopping up some trunk trays we had decided to discard from our baggage, and which in desperation he had pounced upon as fuel for our little fireplace, I made up my mind it was time to go south.

There was one thing, however, which I wanted very much to see. It was Dr. Brown's greenhouse full of South African succulents. In 1902 while in Capetown I had met Marloth, the great student of those most remarkable of all succulent plants, the mesembrianthemums, whose showy aster-like brilliant magenta flowers one sees everywhere along the Mediterranean. In Dr. Brown's back yard we found a miniature greenhouse filled with nothing but tiny plants which might almost be called plant pebbles, for when we looked down at them in their beds of gravel and water-worn stones we were scarcely more aware of their being there than one is of the eggs of the tern when he looks straight at a nest on the beach. Dr. Brown has about a hundred species of these plants which grow so slowly that although he has had some of them for fifty years they are not much larger than they were when he first received them from Marloth and the other keen-eyed observers who discovered them on the South African veldt. The care required to keep these plants from perishing from too much water or from not enough is sufficient to discourage any plant lover, save one like Dr. Brown who has been content to live fifty years in one place without ever having his pets out of his mind for a single day.

I could also not leave England without paying my respects to Sir Vicary Gibbs and seeing his wonderful Aldenham House Gardens at Elstree, Herts. As we saw it on an October day it seemed to me about the most remarkable collection of new and rare shrubs, trees and plants I had ever seen. Here was a man, handicapped with poor health, but with ample means at his disposal, who instead of playing with the hounds, had become so fascinated by his collection of pretty and interesting plants that he had planted two hundred acres with them, put himself in touch with every one who could send him seeds, purchased every novelty advertised in the catalogues, and made of the grounds about his already famous house, a garden of rare plants second to none in the world. It is a lamentable circumstance that in the Botanic Gardens connected with universities one finds far too few of the newly discovered Chinese and Oriental plants—they are filled with the stock species which every Botanic Garden in Europe must have, and there is no room in which to put the new arrivals. Sir Vicary has specialized in new plants, and as I look at my notebook I see twenty-three pages full of the names of rare species which I saw at Aldenham House. Some of these plants, of which I put the names down at Sir Vicary's insistence, because he wanted to send me seeds or cuttings of them, are now, thanks to his generosity, growing in American gardens. I could not help wondering, as we walked together in the late afternoon among his pets, what would become of the place when he was gone, and I asked him. "It will probably go to pieces, for my family do not care for my plants," was his reply. It was the same remark I have heard so often during my travels in America. Is it an illusion to wish or expect that the collections of plants made by an individual shall be taken care of after his death? Cannot some great Foundation be formed for the preservation of living collections such as this one at Aldenham House, to maintain, at least for a century or two, the priceless plants it has taken a lifetime of unusual opportunity and intelligence to bring together? They represent the pigments with which the landscape gardeners of the future should work.

Leaving Sir Vicary Gibbs at his doorstep and wondering when I should see that rare soul again, we drove through the great beech-lined roadways of South England to that most unattractive port, Southampton, and there, in the rain of course (for it seemed to be always raining in October) we shipped our car and took passage for France where we met Mrs. Fairchild, who had been establishing the girls in a school in Switzerland.

CHAPTER III

DUTCH AND BELGIAN GLIMPSES

It was a new and quite wonderful experience to motor through a country where your own language got you nowhere, and its novelty absorbed so much of our time that I fear we did not see much of the country for the first few days.

It took several days in Rouen to become used to the new sense of wealth which a depreciated currency gives. Suddenly, overnight, we had become millionaires, and the best restaurant became, as it were, no more inaccessible than Child's or Harvey's. To order snails served in their attractive silver trays and pressed duck and top it off with Château Iquem, yet pay Child's prices for everything made us seem in a new world. We had left behind the plain boiled potatoes, the roast mutton and half-cooked string beans of the English hotels, and we were again confronted by new food habits. It was quite a matter for thought to realize that the exquisite skill of the French chefs, developed through centuries of epicurean ideals, has never made any more impression on the mass of the people who live, as the crow flies, only a hundred miles north of them, than if they had been on some distant planet. One of my greatest interests in visiting Europe was to see something of these strange food habits and learn of their bearing upon the question of what to plant. During the months which followed we were to have brought before us every day, and three times a day, a changing spectacle of foods, each one of them the product of a fortuitous chain of circumstances, and none of them, in any sense, to be discussed from the standpoint of reasonableness. Why do the French eat snails and the English eat boiled potatoes? Because the French have educated themselves to like snails and the English have apparently, most of them, educated themselves from childhood to like what they call, "plain boiled potatoes." The French will not take the trouble to learn to eat "plain boiled potatoes" and the English see no reason why they should learn to like snails.

The fact that it is these utterly unreasonable habits in food which have determined the development of the agriculture of the world rather than that of the availability of a food, would, I think, be capable of demonstration. I do not know of any vegetables except kale and cabbage which were native to the British Isles at the time of the Norman conquest. The most common vegetable there to-day is the potato, which was unknown previous to the discovery of America. Indeed, the taste for potatoes spread so slowly all over Europe that at the time of Lord Rumford's visit to Vienna in 1788, over two centuries after its introduction, it was still a rarity there. Suppose the ridicule heaped upon it in France had been too great for Parmentier, the great advocate of its excellent qualities, to overcome, or that his sovereign, Louis XVI, had taken a dislike to it and set the fashion against it, how different would be the agriculture of all France!

The practice of eating snails dates back to Roman times when Fulvius Lippinus fattened them for the table on a bouillon made of flour and the lees of wine. It has come down through the centuries, it is not a new fad like postum or corn flakes; to dismiss it with a shrug and a sneer is to show one's lack of education, as the Huns did, when, with their crude food habits, liking meat half raw and nearly decayed, they invaded Gaul so that for centuries the many delicate dishes the Romans had introduced were swept into the background. Imagine what an invasion of Europe by chocolate-eating Americans would mean, people who did not know one wine from another nor cared for French sauces, nor liked truffles or tripe, but wanted ham and eggs, and buckwheat cakes smothered with maple syrup. What would become of the French cuisines?

We did not linger in Northern France, but pushed on for a glimpse of Belgium and Holland before it should get too cold. One never gets over the surprise of finding that hardly has he crossed the frontier between France and Belgium before he is at the gate of the frontier between Belgium and Holland. It is just a pleasant run between breakfast and lunch to cross from France through Belgium into Holland. One is so accustomed to juggle with countries as units of equal value that it comes as a shock to find that Belgium is such a tiny bit of land. It is filled with people, very much filled in fact, but each individual occupies so much less space than does an American, who with his automobile is here and there and everywhere at once, that it does not seem at all congested. The crowds in a Western city seem to surge back and forth, swarming from home to office and from office to lunch room, whereas in Belgium most people walk or ride on street cars; street cars which charge so little for a ride that you cannot resist the temptation of telling the conductor to keep the change.

Belgium is full of horticultural interest, for the Belgians as a people are interested in plants. If they were not, one would not find everywhere all sorts of fruit trees espaliered against the walls of their houses. If you have ever tried to espalier a tree against a wall and every spring and every summer pruned back its hundreds of branches, or pinched out the buds which were not in the right place, you will be in a position to understand the Belgian patience in matters of plant culture. They seem to love to garden. They do not seem to be so restless as the Americans,—they love to stay at home, and they build the romance of their lives right about them where they are, instead of trying to get it by gadding about over the surface of the earth. When I compare the romantic existence of a dear old man I met in the tiny town of Loochristi in the center of a farming country where there are over seven hundred souls to the square mile, with that of the young college student who wrote that amazingly superficial book "The Royal Road to Romance," I cannot help wondering if this modern craze of quick travel gives us the right idea of romance. M. Charles Vuylsteke has spent his life in a comfortable but modest house just off the main street of Loochristi. Behind his dwelling are the orchid houses, where, for over fifty years he has spent most of his waking hours, for he began young with a passion for orchids. He cross-pollinated a species of Odontoglossum from the mountains of tropical America with *Cochlioda nutzliana*, an insignificant looking orchid from Peru, then planted the seeds and for seven years nursed the little plants along until they were old enough to flower. The result was a beautiful new hybrid. From that time on he has been hybridizing orchids and sending the flowers to the great cities of Europe, where he charges his own price for them. He became one of the best known men in the horticultural world, at least in that part of it which is interested in orchids. Never in my life have I seen such beautiful masses of orchids in bloom, and the handsomest of all were the Odontiodas which had originated through the skill of this quiet, unostentatious man. When one thinks of the pleasure his orchids give, and of how they are worn at banquets and balls by the most beautiful women of society, is it surprising that M. Vuylsteke found a great satisfaction in having been the means of bringing such beauty into existence? He has the quiet lasting satisfaction of having created something, rather than the evanescent one of having merely seen something.

I am sure there are scattered through Belgium many such plantsmen as this orchid hybridizer, but only one other was I fortunate enough to see, Houzeau de Lehaie who has gathered around his ancestral château at Mons a rare collection of bamboos. He has acquired these mainly by correspondence and through his acquaintance with the directors of botanic gardens all over Europe. He has set them out in the excellent soil of his garden wherever he had room for them, and through that knowledge one gets from growing plants one's self, he has become an authority on those species which are hardy in Europe. The bamboos are, of all plants, perhaps the most difficult to classify, for they bloom very infrequently, sometimes waiting forty years before doing so, yet the systematic classification of a species must be based on the characters in the flowers. If one were to try to classify the bamboo material found in any of the gardens of Europe, from the specimens of dried leaves, such as are generally all that one finds in the herbaria, one would make a sorry mess of one's classification. In fact, the bamboos are in a mess, scientifically speaking. Houzeau de Lehaie has done, perhaps, as much as anyone to clear this up, so far as the hardy species are concerned, by quietly studying the growing plants of his hobby and observing their relationships, and the world has had to turn to him for advice. He lives in a house built in the 16th Century, the estate has a spring on it to which the simple people of the country still come to bathe their eyes, because of a tradition that it is a sure cure for all eye affections. To an inveterate vagabond like myself the idea of staying all my life in one spot sends a shiver of dread through me, fear perhaps that I should actually take root.

Since it was Mr. Armour's plan to make a trip with the yacht to the Moluccas, which are a part of that vast tropical archipelago belonging to the Dutch, I wanted to renew the associations I had made on previous visits to that part of the world by visiting the botanical institutions of Holland. No country in Europe has better equipped laboratories and institutes and museums than has the Netherlands, and I doubt if Americans are anywhere more genuinely welcomed. There has always been something about the Dutch which reminded me of my own countrymen, a certain practical outlook, perhaps, and a similarity in the home life which has led to the development of the little individual house with its separate dooryard garden. But the unique character of the Dutch, evident the moment one crosses their frontier, is their spotlessness,—that is the only word which can describe them.

I found the herbarium in Leyden a model of splendid arrangement and was able to consult type specimens of the genus garcinia collected in the Malay Archipelago that were not represented in the Kew Herbarium. Dr. Goethart, the Director of the Rijks Herbarium, gave me access to the alcoves of what appeared to me about the most handsomely equipped herbarium I have ever seen. When I compare it with other crowded herbaria I have visited, I realize how much the Government of Holland has appreciated the work done by its botanists in its far-away possessions and how it has tried in every way to dignify the research done there as well as in the laboratories in Holland. Compare the maintenance of this splendid herbarium in Leyden of the tropical plants of the Dutch East Indies with the absence of any such thing in Washington of the Flora of the Philippines. It is true that it is a much discussed question as to whether it is better to concentrate a herbarium of tropical plants in a temperate climate rather than by special protection from insects and moulds, maintain it in the tropical region itself. Holland settles the question for herself by maintaining two great herbaria, one in Leyden and the other in Buitenzorg, Java.

I first visited Holland in 1895 at the invitation of Dr. Melachoir Treub, the distinguished Director of the " 's Lands Plantentuin te Buitenzorg," who was about to return to his post in Java, and, as I had applied for a table in the Laboratory in Buitenzorg he very kindly suggested that I should sail on the same steamer to Java. Naturally after a third of a century I was eager to see again the men I had known in Java at that time, and this was not a difficult matter, for many officials on retiring from their posts in civil service in Java go to live in Holland.

There was Dr. Koningsberger, who, when I had known him in Java, was in charge of the tiny Entomological and Zoölogical Laboratory of the Botanic Gardens, and who, on the death of Director Treub, took his place there. Later, with the democratization of affairs in the East Indies and the formation of the native house of parliament he became its leader. Quite recently he has become the Minister of Colonies, but notwithstanding the cares of his political office he gave me a forenoon of most interesting conversation regarding the present conditions in the colonies and the personalities with whom I had become acquainted thirty years before.

I spent a morning with that remarkable man Dr. Valliton, who has been responsible for more Malayan plant names and identifications than anyone now living in Holland. When I knew him in Java it was feared he would not be able to stand the climate, yet he has outlived many a more robust official and seems to be none the worse for his many years of hard work in the steaming atmosphere of Java, even at seventy enjoying the experience of an aeroplane ride across Holland.

Dr. Janse was teaching Physiological Botany in what seemed to me the most luxurious, most completely equipped and spotless laboratory I had ever been in. Indeed I told him it was so neat and clean that I would be afraid to work in it. He gave me a note to Madam Becker who lived in the island of Noesakambangan south of Java, where the famous rafflesia grows.

We had a charming family dinner in Utrecht with Prof. Went who had just returned from a visit to the Dutch West Indies, and he showed me the slides with which he was instructing his classes regarding his trip.

We spent a day at Baarn with Dr. Westerdyke among the thousands of cultures of parasitic fungi which she has collected from all parts of the globe and with which she now supplies the laboratories of the world, and there I met again Dr. von Romburgh, who in 1895, had charge of the so-called Cultuur Tuin in Buitenzorg. When I last saw him in Java he was wondering whether it would be the *Hevea braziliensis* from Brazil or the native Javanese *Ficus elastica* which would be the great rubber producing tree of Java. Millions of acres of rubber have been planted in the Dutch East Indies since we had met, and almost all are of the Brazilian species.

In Utrecht we were much with the Hubrechts. Madam

Hubrecht is the widow of one of Holland's most noted zoölogists, a friend of the great Anton Dohrn, founder of the Zoölogical Station at Naples, and had herself worked with her husband there in the early days of its existence. She made our stay at Dorn, where she has a country house, excitingly interesting. Her son, Paul Hubrecht, the explorer, has the distinction of being the first white man to traverse New Guinea. When I compared his extreme modesty over this achievement, which required two expeditions, one from the North coast and the other from the South coast, with the extreme publicity accorded certain Polar explorers, I was much impressed with the vast difference in the point of view of the European scientific mind and that which the democratization of science has brought about in America.

His love for the simple savages, particularly the dwarfs of the highlands of New Guinea, made me realize what strange and incorrect ideas civilized man has regarding the lives of the real savage. It seems to me imperative that somewhere a large group of primitive people should be isolated and protected from all contact with outside ideas so that anthropologists of the new type may study their mental processes. As Malinowski has shown, some of the most fundamental things about the emotional life of man, its origin and bearing upon modern society, can be learned by observations on savages. There is a large body of people to-day who are aware of the dangers threatening the extinction of many forms of animal, and even of plant life, but it strikes me that it is much more important that the savage human being should not become extinct. Since the time of Darwin the theories of the evolution of human societies have been based on a comparison of primitive savage communities with the life of so-called civilized man. With the disappearance of the savage this primitive life becomes only a tradition, just as the habits of the great auk and the dodo are a tradition, and just as our knowledge of these strange animals rests upon observations made many years ago by men who were not interested in them from the same point of view that we are to-day, so a few generations hence the psychologists and physiologists and medical men generally, will want to study the life of the primitive savage from an entirely different angle than that which their predecessors take to-day, and it is conceivable that two hundred years from now the existence of a single primitive society might be of incalculable importance.

Why should it be impossible to hold one of the tiny archipelagoes now inhabited by savages from being despoiled by traders or "converted" by missionaries? I cannot believe that the missionary societies could not be shown the necessity for the maintenance of a small primitive community. The expense would not be prohibitive and the political barriers to its accomplishment should not be insurmountable, and I imagine the idea might have the backing of the entire scientific world, were it properly presented to them.

I found The Hague and Amsterdam stimulating places, with their new museums and wonderful book stores where a most amazing array of books on the East Indies was offered. Each of these places was worth a much longer stay than we were able to give, but our plans for Morocco were maturing and we felt we must move on to France where we could inform ourselves with regard to the French Protectorate of Morocco.

CHAPTER IV

AMONG THE HERBARIA AND GARDENS OF FRANCE

A BOTANIST in France naturally gravitates toward the Jardin des Plantes and its Botanical Institute. It has played a remarkable role in the history of botany and through it have come into culture a great number of the plants which are to-day growing in Europe. It was now December and the long rows of leafless trees lining the parkway leading through the garden to the statue of the famous Buffon, made an impression which fades very slowly from my mind. The graciousness of Prof. Lecomte's reception, notwithstanding his recent ill health, made the stay in the herbarium a very interesting and profitable one, during which I learned much about the Garcinias of Cochin China, one of the richest regions for this genus, and heard a great deal about the destructive effects of the war upon the scientific institutions of France. Several visits to the Colonial Herbarium and to the museum of the noted African Explorer, August Chevalier, served as an introduction to the exploration of West Africa, which at that time I had in mind as an alternative in case something should occur to interfere with the East Indian trip.

In the herbarium there was a busy lot of workers under the supervision of that genial and accomplished botanist, Gagnepain, all crowded into one large room with scarcely space enough to turn around. The millions of dried specimens in their herbarium sheets were only available through the medium of trained assistants and yet, crowded as these workers were, they made room for another to squeeze in with his books and specimens, quite as though he were of their own nationality. Such a vast storehouse of type specimens upon which rests so much that relates to the development of the French Colonial possessions, to the whole of tropical agriculture in fact, would seem to be worthy of material assistance from one of our great American Foundations.[1] Civilized man should not let these repositories of knowledge, which cannot be collected again because of the changing character of the flora of the world, crumble to dust for lack of support.

There was another of the men with whom I had much in common, Prof. Bois. He had years ago, in collaboration with a wealthy amateur, M. Delacroix, written a fascinating book called "Le Potager d'un Curieux." It contained accounts of a wide variety of vegetables of foreign origin which M. Delacroix had collected from all over the world and grown in his garden near Paris and experimented with in a culinary way. I had received a good deal of encouragement from that book, because it was the first serious attempt I had ever seen to put into book form the results of experiments involving the tasting of new plants. I was curious to know on how large a scale Messrs. Bois and Delacroix had been able to make their experiments for I had found it required a great deal of time and considerable money to adequately test out a new vegetable. I was disappointed to learn that they had not had the funds at their disposal to make more than the first step in the popularization of many of their new plants. One of them which had become a favorite of mine, the Japanese udo (*Aralia cordata*) they had dismissed rather too summarily, I thought. I had spent much time during several years in perfecting the technique of its culture and its preparation for the table, being finally able to produce blanched shoots two feet long and an inch and a half in diameter at the base, and was able to set before my guests large bowls of delicious salad or to serve the shoots like asparagus on toast. I was curious, therefore, to know whether the udo had been given a fair trial by Messrs. Bois and Delacroix before deciding that they did not like it. I found that they had not carried their tests far enough to get reasonably large blanched shoots, and the trial upon which they condemned the udo to oblivion was made with small thin shoots such as the ones which the plant produces the first and second year after it is set out. With such as these we were not able to get a good idea of the excellent qualities of this vegetable. It deserves a place with celery on our menus, and should be cultivated from New England northward to Labrador. The objectionable turpentine flavor which determined Messrs. Bois and Delacroix to throw it out can be easily eliminated by cooking in several waters, or, if it is to be eaten raw, by letting thin shavings of the shoots stand in ice water for an hour before serving. It is a delicate, very early vegetable, and I know American and Canadian families who have become very fond of it. To my mind it has far more character and merit than the crosne (*Stachys stolonifera*) which, since its introduction from Japan into France fifty years ago, has come to be grown on quite a large scale near Amiens, so I am told.

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[1] Since this was written the Rockefeller Foundation has given it substantial support.

Dr. Bois, of the Jardin des Plantes, with an olive tree on his right and a Japanese loquat on his left; two species which we associate in America with California or Florida. They illustrate the mild winters which prevail in Paris.

Dr. Bois showed me the trees and shrubs of the Botanic Gardens and I was surprised to find some with which I had done a considerable amount of work in America. They were instructive as illustrating the climate of Paris more definitely than figures could do. Protected only by a wall was a small loquat, growing side by side with an olive, both of them trees which we associate only with Florida and California. Then he pointed out a jujube tree (*Zizyphus sativa*) that must have been a hundred years old, a thriving vine of *Passiflora cœrulea* reported to have come from Brazil, and a tree of *Prunus davidiana,* a small smooth-stoned Chinese peach we have spent much time experimenting with, and which must have stood there for sixty years. He had also two interesting bigeneric hybrids, hybrids between plants belonging not only to different species, but to different genera, one between the apple (*Malus*) and the pear (*Pyrus*) and another between the hawthorn (*Cratægus*) and the medlar (*Mespilus*).

The first Japanese paullonia tree to be introduced into Europe. Although its flower forms part of the Imperial Japanese crest, the European botanist who first described it named it after a Russian Princess.

To one like myself who had been introducing plants into America for many years there were two historic trees of great interest. There is the first *Paullonia imperialis* tree to be introduced into Europe, still alive, though now a battered old specimen. It is a curious coincidence that this famous "kiri" tree of

Japan, whose conventionalized flower panicle and leaves have for centuries formed the Japanese emperor's crest, should have been named by two European botanists after the daughter of a Russian emperor who became Empress of the Netherlands, Anna Paulownia, daughter of Paul I. That this tree, which was introduced in 1834, actually within the lifetime of people now living, should cast its shadow over the Japanese botanist Nikai as we walked together from the museum, seemed to me a striking example of the changes which the years have wrought in our knowledge of and our attitude toward Japan. In 1834 Japan was so unknown a country to Europe that the tree whose flower decorated the crest of its emperor was an undiscovered species, to be honored by naming it after the daughter of a Russian emperor, while in 1925, a Japanese botanist was working with his equals in systematic botany, naming and describing the plants from his own and other countries in the same Botanic Garden where his emperor's tree was standing.[2]

The old American black locust tree (*Robinia pseudo acacia*) which is still standing in the Garden, testified to the same changes which have taken place in American botany. It was named by Linnæus in honor of the famous Jean Robin, Herbalist of Henry IV, who introduced it in 1606 and whose son Vespasian planted it in what was then the King's Garden, located outside of the city of Paris. It has been standing where it was planted in 1636, nearly three hundred years ago.

Since these two trees were planted, how many millions have found congenial places to grow in the parks and dooryards of Christendom!

One of the greatest attractions in Paris, in fact one of the most interesting things in all France to a botanist, is the group of arboreta and experimental gardens connected with the firm of Vilmorin Andrieux et Cie which is not only the oldest and one of the most reliable seed firms in the world, but also represents a center of plant interest which beginning in the 18th Century has come down to our time because of the passion for plants of six generations of de Vilmorin men and women.

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[2] As showing how great a rôle chance plays in these matters of plant introduction it is interesting to record that the seeds of Paullonia which the Vicomte de Crissy sent to the Jardin des Plantes were planted in a hot house and failed to grow and were thrown out. On the dump heap a single seed grew, was noticed by one of the gardeners, who rescued it and it later grew into the tree now standing in the Garden.

The cases of the Veitches in England and the de Vilmorins in France might be cited as two of the outstanding examples of a continuous maintenance of great collections of plants under a single family administration. To Americans it is hard to realize that one family could hold together a great estate and devote it to a single purpose for nearly a century and a half.

An American black locust (*Robinia Pseudo Acacia*), standing where it was planted nearly three centuries ago by Robin, Herbalist to King Henry IV. It is a striking demonstration of the permanency an arboretum can give.

Every school boy in America knows the name of Napoleon, and is taught in school that Napoleon introduced the culture of the sugar beet into France, but I doubt if there is a single one of them who knows that it was Louis de Vilmorin who originated this sugar beet, selecting it as a particularly sweet strain from the ordinary beet of the gardens. When one thinks of the coffee cups which since 1856 have been sweetened with sugar made from the sugar beet and then reflects that the originator of such a pleasure-producing thing is forgotten, whereas the great political heroes who have left us so little that is tangible are forever accorded an increasing measure of praise and notoriety, one cannot help wondering if we always have put our praise where it really belongs.

Thanks to the courtesies extended to us by Madame Phillippe de Vilmorin I was able to get some understanding of the feeling of family loyalty which has made possible this continuous history of one of the greatest seed firms in the world. She drove me out to Verrières-le-Buisson, the old country estate where, since 1815 the selection and breeding of forest trees, garden vegetables, flowers, grains and forage crops, has been going on and where is still standing the first hybrid conifer made by the hand of man. It is a cross between *Abies pinsapo* which forms forests in Spain, and *Abies cephalonica* from Greece, and was made by M. Henry L. de Vilmorin in 1867. It is intermediate between the two parents and has borne an abundance of fertile seeds and has grown faster than either of its parents. It has been named *Abies vilmorini*, Mast. and strikingly enough is matched by another tree in the estate, *Juglans vilmorini* supposed to be a hybrid between our American black walnut and the so-called English walnut of Europe.

I felt the romance of the place most keenly as Madame de Vilmorin ushered me into the Library of Genetics, which forms a part of this unique institution with its long history of plant hybridizing, and I saw about me everywhere the evidences of long continued breeding experiments on wheat, oats, and other staple cereals, on the industrial sugar beets, on numberless varieties of ornamental plants and on the important commercial vegetables of the temperate regions. I realized as never before how these have contributed, through the medium of a wonderfully conducted system of exchange and sale to give better seeds than the world had known before to plant growers all over the globe.

I had previously met two of the great personalities of this romantic institution, Maurice and Phillippe de Vilmorin, both of whom had received me with that open-handed hospitality and simple scientific interest for which they were famous, and had

Above—The veteran Plant Introducer, "Ancien Chef de Cultures," S. Mottet, with his successor A. Meunissier and an assistant, standing before the Laboratory at Verrières. France owes much to the skill and knowledge of such men as these.
Below—The Institute Vilmorin at Verrières, where plant breeding has been going on since 1815.

encouraged me in the work of introducing new plants into America.

The new science of Genetics lost one of its most remarkable supporters when Phillippe de Vilmorin passed away, as anyone can see by reading the accounts of the Fourth International Conference on Genetics, for which he was so largely responsible, and which met here in Verrières as the guest of the de Vilmorin family in September of 1911. I would like to have been able to say to these great believers in the science of Genetics how much their enthusiasm and their demonstrations of the practical value of Plant Breeding have encouraged the American Genetic Association in its development and kept alive the Journal of Heredity which was started in 1910.

Turning from the past to the present I found still active and full of the enthusiasm of true plantsmen, the Ancien Chef des Cultures of the Maison Vilmorin, S. Mottet and his successor M. A. Meunissier, who is now in charge of the estate. It was December, and in France this is no month in which to visit a collection of trees and shrubs, but nevertheless I took away with me impressions of the lasting value to a country of such an institution as this, disseminating as it does the best ornamental trees, shrubs and plants which are to be found in the world. France is a country of wonderful avenues and beautiful gardens, but if you should take out of it all the introduced species of plants upon which it depends for that beauty it would lose much of its characteristic charm.

I did not leave Verrières empty handed, and as a result of the visit which I made to it, there arrived in Washington among other rare plants, *Clematis armandi* from Hupeh, China, with hardy, persistent foliage and fragrant white flowers; *Clematis spooneri*, also from China, with flowers sometimes nearly four inches across; a new variety of barley "premier à Barbe Lisse," with smooth silky awns, the result of long breeding and selection, *Decaisnea fargesi*, a handsome shrub with beautiful foliage and curious blue fruits the size of one's finger, originally introduced from China; *Columnea verrierensis*, a new hybrid between *C. gloriosa* and *C. schidiana*, a Gesneriaceæ from South America which M. Mottet recommended highly for trial in our Southern states; two ornamental grapevines, *Vitis megalophylla,* a species with immense leaves which should make it suitable for arbors, and *Vitis sempervirens*, a small-leaved species which, if it proves hardy, might add another evergreen ornamental vine to the Southern states; and *Viburnum davidi*, a very handsome evergreen dooryard shrub from China.

It will be interesting after a lapse of years to see which of these plants survive in America and what becomes of them.

Of course there are hosts of interesting botanical things about Paris, but I surmise many American botanists pass through this region without knowing of the quite charming and altogether interesting Arboretum Allard near Angers, just a short distance from Paris. I went there as the guest of Prof. Blaringhem, who since M. Allard's death has been in charge. There are scarcely more than sixteen acres in the property, but these are filled with rare and interesting exotic conifers. These have been cared for in a most unusual way, and I was so struck by the amount of care with which the holes were made for the specimen trees and the way in which the ground was worked over, that I cannot resist calling these points to the attention of my American tree-planting friends. In passing through the nursery I had noticed a man working in a ditch and inquired what he was doing, and was told that he was turning over the soil of the whole nursery by hand to a depth of three feet! He first dug a trench, throwing out the dirt in a pile, then he dug a second trench and filled that with the dirt from the first one, then a trench to be filled with the dirt from the second one, and so on, until in this way he turned over all the soil in the whole area. This procedure, I am told, is one which is performed every five years or so in the nursery regions of France. Is it any wonder that plants set out in such hand-pulverized and thoroughly loosened-up soil, to which an abundance of well-rotted manure has been added every year, should grow luxuriantly? I was reminded as I stood looking at this workman, of a remark made by Sir Vicary Gibbs in referring to a wonderful rose garden which, he said, had occupied the same piece of land on his estate for forty consecutive years. I asked him how deeply it had been trenched and he said "I think about five feet." What amateur gardener in America in making the trench near the house in which he tries to grow his best plants ever goes down five feet and fills the whole depth with the best soil he can get? Deep trenching with thorough drainage at the bottom is the great secret of successful gardening, whether one plants shrubs or perennials.

In wandering about through the remarkable collection of conifers my eye caught sight of an excavation which might have been that made by a bomb from a 12 centimeter gun. It was six feet across and three feet deep and when I inquired what it was for, Prof. Blaringhem explained that in setting a new specimen of conifer, even if it were only two feet high, the procedure was to open this large hole, leave it open for six months and then fill it with good soil, mounding it up to a height of two feet and planting the young tree on this mound. This method has been adopted because of the wet character of the soil, and to judge from the looks of the trees it has been eminently successful. How can one be sure he cannot grow an exotic tree until he has given it the care accorded the hundreds of rare conifers and other species of plants growing in the little arboretum in Angers?

Among the rarities of this collection which might well attract the attention of Americans living in the extreme south was the *Keteleeria fortunei*, Carr, a small genus of conifers related to the firs, which was first discovered by Fortune in a temple at Fu-tchou-fu in Southeastern China and which has fruited in Northern Italy; the handsome Syrian juniper (*Juniperus drupacea,* Labill) which thrives on calcareous soils and might do well in the lime soils of Florida, where it deserves to be tried; and the Formosan pine (*Pinus armandi,* Franch) which was introduced about 1895 and fruits well at Angers.

I was surprised to see a very handsome *Sequoia gigantea* fifty-two years old which already tops the other trees in the arboretum,

Above—Director Blaringhem demonstrating the usual excavation made for the planting of a tree in the Allard Arboretum.
Below—Digging over the soil of the nursery by hand to a depth of three feet.

and, if it keeps on growing, will become the most striking object in the landscape, as so many of these California sequoias are becoming throughout France and Switzerland wherever they are hardy. There are specimens already sixty feet in height at Les Barres in Central France.

There was one thing which rather annoyed me, although I had no right to let it, I suppose. It was that although a beautiful specimen of the Japanese persimmon (*Diospyros kaki*) was in full fruit, the delicious ripe fruits were falling unnoticed on the ground. Prof. Blaringhem called the variety "costata," and I suspect it is the same as that grown successfully in Virginia and shipped to the Washington market where the fruits sell for very good prices. When I asked Prof. Blaringhem why nobody ate them he shrugged his shoulders and remarked very simply, *"On ne les mange pas ici."* The persimmon has been in France for a century, and yet I venture to state that there is not a single orchard of it in the country. In California there are 2,274 acres already planted to the persimmon, and while only five hundred and eighty-two acres have yet come into bearing, the value of persimmon orchards last year was $85,000. I wonder if one is warranted in making the generalization that the French are not changing their food habits, whereas Americans are? The persimmon is not an isolated case. The same fixity of food taste has prevented them from eating corn, or maize, as they call it, in any of the hundreds of ways that we do, and it has deterred the Algerian horticulturists from growing the delicious grapefruit for the French market.

I have rather come to the opinion that there is something fortuitous about this matter of new foods. I do not think the fact that a new food lies unnoticed for many years in a country has any deeper significance than that there is no machinery for its popularization—no method of making it pay its own way.

I had a good example of this in Paris. I have posed as being familiar with most of the common vegetables, having tried all I have ever seen, but I had not been in Paris a day when my friends, the Spicer-Simsons, served me the salad "mache" with which I was entirely unfamiliar. I had the chagrin of learning from M. de Vilmorin that mache (*Valerianella olitoria*) is offered for sale in America under the name "corn salad." I had never seen it growing in America and never eaten it in any hotel. It certainly deserves to be thoroughly tried in the northernmost portions of the country where an annual, quick-growing salad which can be gathered a few weeks after sowing would be a change from the eternal spinach and lettuce and chicory. I have determined to try corn salad in Nova Scotia as a summer salad plant. Why has mache never been more popular with Americans? The answer would be the same as that to the question of why Japanese persimmons have not taken in France. It has not paid anyone to push it.

Before leaving Paris I was determined to make the acquaintance of one of the Chefs of the Cordon Bleu. A certain M. Ranavolo was giving lectures with demonstrations in one of the department stores in Paris, and through the skillful intervention of my friend Spicer-Simson, the medalist, he and I were permitted to attend one of these usually exclusively feminine seances. I had grown up under the shadow of the domestic science movement and have many women friends who are in that "line of work" as the jargon would have it, but this demonstration by Ranavolo took me completely by surprise. The seats were crowded with women who were experts. You had only to take one look to see that. They had their pencils and paper, but from the fact that only once in a while did they jot down something, it was evident that all the usual details, which kept me busy scribbling, were familiar to them. The chef cooked and prepared a whole series of dishes all at once and each one of them as they matured he brought to Spicer-Simson and me—not to the ladies—to taste. The result of his captivating skill was that we secured his services for a Sunday morning at the studio, with the understanding that he would cook eight of the Parisian vegetables before our eyes and serve a dinner at the same time.

He came, and over two gas stoves gave a demonstration of skill I shall never forget, even though I have forgotten all of the complicated recipes save one, *épinards en branche baignés.* To know how to make spinach fritters as he did, by first scalding the leaves, without taking them off their stems and then dipping them into a thin batter and frying them in deep olive oil, was worth the whole modest cost of the performance. I have tried this method since on the succulent branch tips of the chaya tree of Yucatan (*Jatropa urens*) that I have growing in my garden in Coconut Grove, Florida, and found it to produce a most delicious new dish.

There were three individual horticulturists in France for whom I had conceived a very unusual regard through seeing the results of their breeding work. They were M. Leon Chenault, who had been for many years one of the foremost nurserymen of France, and whose gardens had been the first testing-out place for hundreds of new species and varieties of plants, especially from the Orient; M. Lemoine, the great breeder of lilacs, deutzias and other ornamental shrubs; and Pernet Ducher, than whom there has never been a greater breeder of roses. I was able to see M. Chenault and M. Ducher, but not, unfortunately, M. Lemoine. I spent a delightful day with Chenault and his son at Orléans, where Chenault père has, in his five-acre yard in the suburbs of the city, a most unusual lot of rare Chinese shrubs gathered together since his retirement to a new home in Orleans fourteen years ago. It seemed hardly credible that in this climate, in so short a time, one could so transform a place and almost entirely with comparatively newly introduced things, but when one has been a nurseryman and dealt with a great variety of plants for fifty years one knows just what to plant. I venture to think that there were more rare species of plants in these few acres than are to be found in many a so-called "Botanic

Garden." At a risk of being pedantic and for the purpose of proving my point, let me enumerate those I saw in the brief period of my stay there. I only noted those which attracted my fancy.

Rosa sericea petrolutea, Himalayan rose. *Dipelta floribunda* from Central China, a shrub with pale rose, orange-throated flowers. *Rhus cotinus atropurpureus* (Rehder's *Cotinus coggygria,* Scop) a charming form of the smoke tree, *Ribes speciosum* var. *fuchsioides,* an evergreen shrub with flowers like fuchsias which, in its simpler form, is wild in California. *Rubus deliciosa,* a handsome, large, white-flowered raspberry from Colorado. *Phygelius capensis*, a handsome Scrophulariaceæ from the Cape, known as the Cape Figwort. *Eleagnus reflexa*, a variety, according to Rehder, of *E. pungens* from Japan. *Callicarpa chenaulti,* a species which I find described nowhere in my books. *Prunus blireans,* a double-flowered prunus, very floriferous, which Rehder gives as a hybrid between *Prunus cerasifera* var. *pissardii* and the Japanese apricot, *Prunus mume. Forsythia vitellina*, a variety of *F. intermedia* with long yellow flowers. *Berberis rugidicans*, a new form sent in by a German who was traveling in China. *Osmanthus delavayi,* a fragrant-flowered species found in China in 1890. *Phillyrea angustifolia*, a Mediterranean species of *Oleaceæ* used for background. *Berberis stenophylla,* Moore var. *Invinii,* a cross of *B. darwinii* and *B. stenophylla. Viburnum davidi,* Franch, a superb evergreen viburnum, from Szechuan, China, which, in the half-shade of the house, was at the time of my visit covered with masses of the loveliest steel-blue fruits. *Magnolia delavayi,* Franch, from Southwest China, resembling our American *Magnolia grandiflora* in having evergreen foliage. *Osmanthus armatus,* Diels, a Chinese introduction of 1902, with handsome, long evergreen leaves, and its relative, *O. delavayi,* Franch, which bears delicate white fragrant flowers in April. Of his Cotoneasters, *C. humifusa*, Duthie (*C. Dammeri*, Schneider) seemed to be a remarkable ground cover, spreading over the ground almost like an ivy. I have since seen this species in the Puget Sound region of America where it has attracted a great deal of attention. *Cotoneaster salicifolia*, Franch var. *floccosa,* Rehder and Wilson, seemed to me, as I photographed M. Leon Chenault and his son, R. Chenault under a bush of it in full fruit, about the most stylish of all the cotoneasters I had ever seen; the arrangement of the branches in rifts laden with brilliant red fruits, gave it a real cachet. *Viburnum coriaceum*, Blume, is a curious shrub with leaves upon which one can write one's name with a pointed stick or one's finger nail, the surface touched turning white and remaining visible for some days. *Peonia lutea* crossed with *P. moutan,* the so-called Souvenir de Prof. Maxime Cornu, the great French botanist bears yellow and red sweet-scented flowers. The yellow flowered peony was introduced by Prof. Cornu from Yunan in 1900 and this is one of the hybrids from it. I did not see it in bloom, unfortunately. In the background is an Atlas cedar which has grown to be a foot in diameter in the fourteen years since it was planted.

It is a charming garden in which scarcely a single plant is native of France. I think it would shatter any theory that in a walled enclosure one must have native plants. The beauty depends upon the selection of the species and not on any mystical feeling which is supposed to come from the fact that they are native. Many Chinese and Japanese species are as much at home in America as in their own habitat. The drooping Japanese flowering cherry (*P. subhirtella*) that I planted in a place in the woods of Maryland, went wild there and in a generation one would come to think of it as native.

CHAPTER V

THROUGH FRANCE AND SWITZERLAND TO ALGERIA

It is amazing how little information one can obtain about one country from the inhabitants of another. We imagined that of course every Frenchman knew about the new French Colony of Morocco, which is no farther away from Paris than Cuba is from New York. We asked our acquaintances about the roads and could get no information from them as to whether it would be advisable to take a car or not. Even a young man who lived in Morocco, whom we met through our friends the Robert Davises, advised us strongly not to take one as we would get lost on the "pistes" or trails, not being able to read or speak Arabic. Mrs. Davis, who had lived in Morocco herself, advised me to take firearms with me as the dogs were so annoying. After blundering around, as every one who knows Europe is aware one must do before getting on the right trail of information, we found at 21 Rue des Pyramides a fully equipped Bureau of Information with two charming and efficient experts in charge, M. Nacivet, the Directeur, and M. Terrier, Councillor du Bureau de Maroc. Through the kindly intervention of Mrs. Davis they gave us letters to Maréchal Lyautey, the great Resident General of Morocco, which were of the greatest value, giving us the courtesy of the ports and ensuring us the most helpful treatment on the part of the officials there, even though our stay coincided with the outbreak of hostilities on the Riff.

Equipped with these papers and determined to take the car, notwithstanding the skepticism of our French friends, we set out for Switzerland to say good-by to our two daughters, Barbara and Nancy Bell who were there in school. It was January and the weather was cool, with that mistiness so characteristic of France, but we determined to stop en route to see the National Arboretum des Barres at Nogent sur Vernisson. I had never heard of this arboretum until Jacques de Vilmorin told me that it was one of the best of all the arboreta in France and that I should by all means see it even though it was winter. He advised us to stop at Gien, where there was a little hotel of which the owner was a great chef, noted throughout Central France for his remarkable *"ris de veau aux petits onions."* We stopped at the little Hotel du Rivage and found the *ris de veau* all and more than we had anticipated. Such little hotels as this, serving some specialty or other, are scattered all over France and the French gourmets know all about them. In fact a Russian gourmet, Marcel Rouff, has written a most entertaining little work called "La France Gastronomique." It is in thirteen little volumes, each dealing with a particular province of France and telling where the various specialties are to be found.

I shall never forget the frosty January morning when we set out from Gien in the car for the Arboretum des Barres through avenues of plane trees and European elms. Nor can we ever forget the hospitality of the Director, Monsieur Pardé and Madame Pardé, without whose courtesies the Arboretum would have been a very different place indeed.

There are two distinct or partially distinct parts to this establishment: the arboretum proper, which is planted exclusively with trees, and the Fruticetum Vilmorinianum where are collected the shrubs and perennial plants. Although the arboretum was only begun in 1873, the estate of about one hundred and fifty acres had come into the possession of Pierre-Phillippe-André de Vilmorin as far back as 1821, when he began at once planting groves of the Calabrian pine, Scotch pine and Maritime pine with seed from different localities, together with specimens of Spanish silver fir, cedar of Lebanon, and the oaks and nut trees of America. After forty-five years, during all of which time he had continued his plantings, the estate was sold to the Government (in 1866), and since that time has been the seat of a school of practical forestry.

It is in such institutions as this that France trains men for positions in its great Département des Eaux et Forêts which has much to do with the keeping up of the forests of France. Let a knowledge of the species of trees die out and French forestry would fall upon evil days. Without the plantsmen which such an arboretum as Les Barres makes it possible to train, the whole fabric of forests and collections of rare and beautiful trees such as beautify the country from one end to the other would go to pieces. France knows this.

The fruticetum represents the initiative of Maurice L. de Vilmorin and was not really begun until 1894. It is romantic to read in M. de Vilmorin's catalogue how he used to take baskets full of living specimens from his fruticetum to the museum in the Jardin des Plantes and there, with Franchet, compare them with the dried specimens which had been sent in by such collectors as Armand, David, Delavay, Fargs and Souilie, some of the missionary collectors in China in the early years of its exploration, before Wilson entered it with his systematic dragnet methods, or Frank Meyer with his horticultural instincts. It was often difficult to determine whether a species belonged in his fruticetum, which was supposed to contain only shrubs, or whether it would grow up into a tree and belong over the line in the arboretum. Something of the same difficulty is experienced by those who dislike to see hardy perennials growing in an arboretum. The fact is, any classification into trees, shrubs, and hardy perennials is more or less arbitrary. A hardy perennial which freezes to the ground every year in the north, in the south may grow into a hard-wooded bush or even into a tree.

To give any adequate account of these two distinct institutions from a visit to them in January, is, of course, impossible, but there did stand out certain things which I trust will interest my readers.

The hybrid between our American red oak (*Quercus rubra*) and the pin oak (*Quercus palustris*) is now a magnificent specimen more than sixty feet high, fruiting regularly, and deserves the attention of those who are breeding new forest trees. It served as an introduction to the whole question of American oaks in France, and it was extremely interesting to have M. Pardé lead us into what, to all intents, was a bit of Maryland forest with three species of American hickory, *H. amara, H. alba* and *H. porcina* the Virginia juniper (*Juniperus virginiana*), and the red oak (*Quercus rubra*) which is perfectly at home there as well as the scrub oak (*Quercus ilicifolia*) which makes such a dense cover for game that its acorns are in great demand by the owners of shooting preserves.[1]

It is one thing, of course, to prove that a foreign tree will grow in its new home, but quite another to show that it will reproduce there. In forestry work one must decide this before going ahead with extensive plantings. This explained the enthusiasm with which M. Pardé showed me the seedlings from various American oaks such as *Q. rubra, coccinea, ilicifolia,* and *palustris* growing in his forest. It is such oaks as these, belonging to the red oak class, that he is counting on using. The group of species developing their acorns in a single year, represented by the white oak, seem not to be adapted to the conditions of central France. How could one have anticipated that these American oaks would thrive and the American elm be a failure as M. Pardé says it is?

It is just such questions as these that cannot conceivably be settled without an arboretum, maintained unchanged for at least a century. America has lost at least a half-century by not establishing, in connection with its agricultural colleges, extensive collections of trees from all over the world to determine which trees will adapt themselves to the conditions of the location in which they are placed.

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[1] The tulip poplars (*Liriodendron tulipifera*), which have been growing at Les Barres for many years seem all to die of a fungus disease that attacks the inner bark at the ground; nor do the white oaks flourish there, but they helped complete the picture of a little American forest in France.

Wandering over into the fruticetum, which is still under the charge of the same remarkable person, M. C. Lemosse, who was head gardener under M. de Vilmorin himself, I found many plants of great interest. There stood a ten-year-old specimen of the Chinese chestnut (*Castanea mollissima*), with which we Americans have been experimenting since 1910, and which appeared to be growing well there. A new form of *Albizzia julibrissin* called *Nemu* by Bentham and said to be hardier, with stamens of deeper violet than the one usually grown, seems worthy of distribution in America. There was a striking Tibetan hazel (*Corylus tibetica,* Batal) which was in fruit, with burs more like those of a chestnut than a hazel, and which, according to M. Lemosse, produces hybridized nuts as shown by the many seedlings which he has raised from the nuts. Knowing the interest in hazelnut culture in the Western United States, I secured some of these seeds and had the satisfaction later of seeing young plants from them growing in our nurseries in Maryland. In view of the attempts which the veteran hazelnut grower of Vancouver, Washington, Mr. Quarnburg, is making to find better stocks than that of the ordinary hazel, I think these hybrids may be of service in the development of the hazelnut or filbert industry in America.

One of the great world collections of the genus Rosa is here in this Fruticetum, spread out before one, and although it was winter I could well imagine what a dream of beauty it must be in spring. When one considers that in the Middle Ages there were only a few species of rose in cultivation, whereas to-day there are more than three thousand varieties listed in the catalogues, one cannot but be impressed with the accomplishments of horticulture. Much yet remains to be done, for although roses for the cool moist regions of Europe have been produced by the hundreds, by hybridization, very little in the way of plant breeding has been attempted with the idea of producing roses for those regions of America that have a warm winter and a hot, almost tropical, summer. Those which M. Cayeux made while in Lisbon, between

Rosa gigantea, the Burmese Giant rose and some hybrid teas, are examples of what I mean. "La Bella Portugaisa," one of his hybrids, has been very successful in California. The time was altogether too short and the weather too inclement to enable us to do justice to these remarkable collections, but thanks to the Directors of these institutions, seeds of fifty-five species which I selected were later received in Washington and many of these are now disseminated in America.

As we motored through the Eastern Province of France called the Haute Savoie, I noticed, drying under the overhanging eaves of a peasant barn, ears of corn with their husks braided together. It was a fine variety of flint corn. I got out and spoke to the peasant in the barn and he pulled an ear down. I talked with him about the uses he made of the corn and found that in this part of France there was once a time when the peasants ate Indian corn, but they have given it up pretty generally, although occasionally they make a kind of soup out of it. He listened incredulously to my account of how in America we make a host of delicacies out of it and then said quite simply but firmly, "Here we feed it to the cattle and chickens." To have learned the use of such a food and then to have discarded it seemed to me the worst thing that I had ever heard about the French. Often have I been taken down and put where I belong, away down in the scale of gourmets by the simple remark, "Oh yes, I've tried it; it isn't fit to eat." It is perhaps true that it is nobody else's business what one eats, but is it not uneducated to complain because one cannot get what he particularly wants when there is an abundance of something else which is just as good? There always seemed to me to have been something of stubbornness in the refusal of Europeans generally to substitute Indian corn for their beloved wheat during the war.

There is an institution in Geneva which in my opinion rivals all others in two things—the completeness of its library, and its quiet. I refer to the Conservatoire Botanique over which one of the truly great men in the science of systematic botany has charge, Dr. John Briquet. It is of course one of the Meccas of all systematists who visit Europe, both for its wonderful herbarium and library, and also because of its association with the great family of botanists, the de Candolles. For three generations the de Candolles with intense interest and ample means gathered herbaria from all parts of the world and bought complete collections of books on botany. These collections, both of books and specimens, have been added to through the years and are now so admirably arranged and catalogued that they constitute a most remarkable environment in which to work and study. The accumulated botanical knowledge of centuries is around one and so conveniently placed that one can almost reach the books from where one sits in the secluded alcoves. There reigns in the place a quiet like that of other days—the quiet of the cloister, and I shall never forget the delightful hours which, through the kindness of Dr. Briquet, I was permitted to spend there, reviewing the literature with regard to those regions it was our intention to visit later on, finding what books to get for the little library on the yacht which was to be of such great assistance later.

"We don't think corn is good to eat; we only feed it to the chickens."

The Conservatoire Botanique is one of those repositories of knowledge which deserves to be preserved at all costs, as it represents one of the corner stones in civilized man's knowledge of plants and will be of increasing value through the centuries, including as it does type specimens and first-hand observations that can never be assembled again. To let such peaks of knowledge crumble seems about as tragic to the scientific man as letting the spires of a cathedral fall would be to a religious person.

Before leaving for the Orient I had a long talk with Dr. Briquet about the plight of the Conservatoire, due to lack of funds. Thinking that something might come out of an appeal to her keen scientific sympathies and her great interest in plants, I gave Dr. Briquet a letter of introduction to that remarkable old lady who has recently passed away, Mrs. Elizabeth Wetmore, and wrote her a brief note of appeal.

With her characteristic initiative and clear understanding of conditions, Mrs. Wetmore took up the matter and interested friends in the Rockefeller Foundation, one of whose officers happened to visit her soon afterward. The result was an offer of help from the Foundation, with the stipulation that a specified amount should be raised by the Conservatoire. When I returned from Java, I found the committee formed to do this had been unable to secure the entire amount from European contributions. Dr. Briquet had gone to Morocco on a short exploring expedition, and had been thrown from his horse and so seriously injured that he was still in a hospital at Oujda. A group of interested persons was found to give the remaining funds which insured the permanence of the Conservatoire Botanique. No other result of the Expedition has given me a greater thrill than the letter of gratitude from Dr. Briquet while he lay in the hospital in Morocco, expressing confidence in our ability and desire to help him. It was the letter of a true savant emphasizing the greatness of the institution and belittling his own work.

The third of February found us, Mrs. Fairchild, Graham, and me, bidding two young American girls adieu on the doorsteps of a Swiss school, and with dry throats waving them farewell as the car shot out and down into the gorge of the Rhône, following it through the Alps on our way to Lyon. By this time our car had taken us into so many interesting places and across so many frontiers that it had acquired a real personality. The license tag given it by the Royal Automobile Club of England was QQ-3108, so "QQ" the car came to be called, and I am sure no other car ever had more affection bestowed upon it from a wider circle of friends.

I had always wanted to see the greatest of all living rose breeders, Pernet Ducher, particularly because I had known intimately the great American rosarian, Walter Van Fleet. Indeed the very day before Dr. Van Fleet's death I had written from his dictation the tale of the two roses which will keep his memory alive longer than any of his other creations, the Silver Moon and the Walter Van Fleet, two climbing roses that I have seen from Maryland to British Columbia, covering, I should suppose, many miles of arbors in the aggregate. I had often seen Pernet Ducher's Lyon rose and other of his originations. I wanted to find out whether Pernet Ducher was any exception to the rule that no plant breeder makes any real money out of his creations.

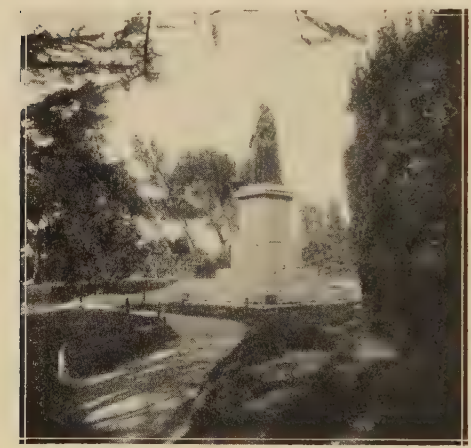
In Paris we were told that he lived at Vennissieux, a village a few kilometres from St. Fons. We inquired at the square in Vennissieux and were given vague directions. We stumbled about for the better part of an hour, discovering that nobody knew anything about M. Pernet Ducher. It was a factory town, quite the opposite of what we had expected, with surroundings as unattractive as those in the suburbs of Jersey City. It was hard to believe that we were in the environment in which lived the man who had produced such superbly beautiful denizens of the flower garden. At last we found the place and rang the bell at the simple iron gate and a pretty young girl admitted us to the yard. There were no evidences of our being in any other than one of the thousands of little houses just like this one, shut in from the ugly street with a high stone wall. An old unused hothouse, a single spruce tree, no sign of a garden.

The girl ushered us into the room where Pernet Ducher sat working. He seemed a bit startled to be taken unannounced by three American visitors. He sat at a plain deal table in his simple working costume with little piles of yellow plant labels beside him. At one end of the long table the girl sat down at a typewriter. A desk in the corner was littered up with papers and on the wall hung a diploma and a photograph of a hothouse in England full of roses, doubtless roses of his production. The haggard look in his face was relieved by piercing dark eyes, and when he spoke his French was the cultivated French of a gentleman. I told him that I had come to pay my respects to him as the greatest rose breeder in the world. We spoke at length of Van Fleet, whose roses he knew. When I remarked that I thought it was a pity that new plants could not be patented his face brightened and he said he felt so too. As an example he recounted how in 1894, before he had become known as a rose breeder he had originated "Mabel Chatenay" but *"pas un centime"* had he ever gotten for it, yet to-day it is grown by the million in all the countries of the world. The trouble in France, he said, was that although they had talked much about *brèvetées* (patents) for plants there are more horticulturists who are against them than for them. I remarked that in America we were coming to feel that there were perhaps fewer plant breeders now than there were twenty years ago, and he said "unfortunately it is the same in France." Then Mrs. Fairchild asked him if he had anyone who would follow him. "No. I had two sons but they both fell in the war." With these words he dropped his hands in his lap in a pathetic, helpless way and we saw that we had touched the subject closest to his heart. There was something feverish about the atmosphere and I felt as though he wanted to go on with the writing of the labels with which he was busy when we entered.

The whole surroundings and the man made a deep impression upon me, the impression of a solitary soul working alone. There is something touching in the picture of this man originating the most superb roses year after year, quite unrecompensed, roses for which the wealthy women of the world are paying millions, and on which they would no more object to paying a royalty than they do on the powder they put on their noses.

Before I left I inquired of M. Ducher if there were any printed description of his work and he simply said *"Ah non."* I was even brave enough to inquire if he cared to write one to which he replied, "Unfortunately I have not the time." I knew Burbank well in the early period of his life and spent a night once as his guest in Santa Rosa. I could not refrain from contrasting these two characters. The one with a flair for publicity in a country of publicists and the other with no desire for the notoriety which the newspapers might be able to give him in France. There was a quiet greatness about Pernet Ducher which it would be well for anyone to study. He is sixty-five years old, has spent thirty-five years in the simple house where he is now living and yet five kilometres away from his house in a neighboring village where we stopped to inquire where his house was, I had a discussion with a hotel keeper who said there was no such man living anywhere about—he knew, for he had lived there twenty-five years. From the American standpoint there is no such thing as general publicity in France. The inhabitants of one village don't know and don't care what is going on in the next. The newspapers are mainly political organs of propaganda—they are not intended to tell one man what his neighbor is doing, indeed I doubt if it would pay to do so in France as it seems to in America.

The Palace of the Popes at Avignon attracts streams of tourists, and the surroundings of the old historic place are beautiful, but to me there were two things of especial interest, one of them being the statue of A. Jean Althen, erected by the inhabitants of Vaucluse to the introducer of the madder plant. As we stood on the outlook back of the Palace of the Popes overlooking the valley of the Rhône, with the draped statue of Jean Althen, *"introducteur de la garance,"* silhouetted against the sky, I was conscious of a feeling of disappointment. Here was the only statue I had ever seen of the introducer of a plant culture into a new country; it was as well done as hundreds of statues that have been erected to the memory of political, or religious or military heroes whose exploits were things of a moment, but in this case the industry of growing madder for the purpose of making a red dye out of it had completely disappeared with the coming of the coal-tar dyes, and the reason for the statue somehow seemed to have vanished. Just why a man who started a plant industry which for many years supported thousands of happy homes should not have a statue erected to his memory is after all, not clear, for he contributed probably much more to the world of France than countless numbers of political heroes or spectacular warriors whose figures in marble and bronze decorate the parks of the country. Madder is the dried root of *Rubia tinctoria* and for centuries was used extensively by the dyers of Europe.



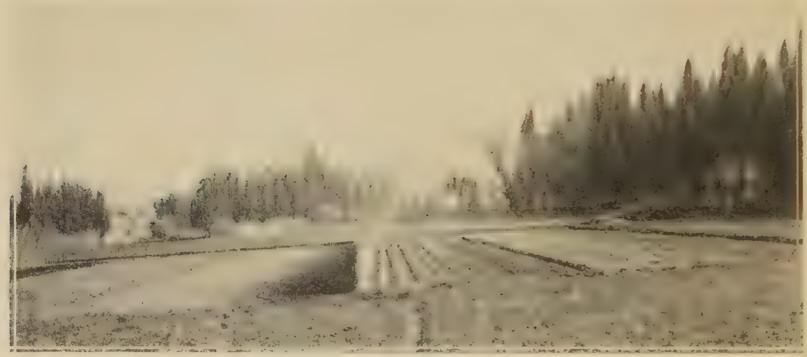
The only monument to a plant introducer that I have ever seen is this one to Jean Althen, who brought madder into France.

My second interest in Avignon was also a statue, one of the great entomologist, Henri Fabre, who lived his quiet life near Avignon. It stands in the enclosure before the School of Medicine. There is something fascinating about the thin face and sunken eyes of this recluse, who by his studies of the lives of the insects he found all around him in Provence and by his anthropomorphization of them has made his accounts of their activities read like the doings of men and women.

A curious coincidence happened while we were photographing the statue of Henri Fabre. As I wandered about looking for the best place from which to picture the statue, I noticed on the ground glass of my camera, a clock on the wall of the School of Medicine, and saw that it had stopped at exactly twelve minutes past five. Instinctively I reached for my own watch to see what the real time was, and to my surprise found that it, too, had stopped at exactly twelve minutes past five. The coincidence was the more surprising because it was really by the merest chance that we were there at all. We had had a great deal of difficuly in finding where the statue was and had about decided we must push on. I held up my watch and had Graham take a photograph of the clock and the watch with the hands standing at the same hour, but unfortunately, although it is a good enough photograph to show to my friends it is not clear enough for reproduction. I think it is perhaps the first photograph of a coincidence ever taken. More should be made and published, in my opinion, to dispel the mystery which so many people throw about coincidences.

South of Avignon, near the town of Eyragne, we passed through some fascinating market-gardening country. There, cut up into tiny squares by means of rows of Italian cypresses and tight fences made of woven stems of the common cane (*Arundo donax*), were most wonderfully tilled patches of winter vegetables, being brought on for the Paris market. It was February, and we were in the latitude of Halifax, and yet with this slight wind protection they were growing vegetables out of doors! Why so little is done in the use of windbreaks in the trucking regions of America I have been puzzled to find out. I have never seen anywhere such windbreaks as are to be seen in use in this region, and also on the north coast of Africa where they run down almost to the very shores of the Mediterranean. Perhaps the fact that our market gardeners have to contend with a continental climate, whereas the French have a maritime one may explain this. Possibly our fields are so big that people have forgotten about windbreaks, or perhaps they have never experimented with them at all. There can hardly be any doubt that much finer and better plants could be grown if given protection from even the comparatively unobserved winds which blow in winter across the market gardens of America. Whether it would pay is, of course, another matter.

Had we known how interesting this part of France is in winter, and had Mrs. Fairchild set her eyes sooner on Les Baux, whose limestone rocks topped with tile roofs rise like some gigantic castle out of the plains covered with almonds and olives, it might have been more difficult to push on toward Morocco, but the real winter was coming, and let no inhabitant of South Florida imagine that the coast of the Mediterranean is warm in winter, for, although the temperatures do not go much lower than they often do in Florida, they stay down. It is impossible for this old globe to juggle with her temperatures to such an extent that a place in the latitude of Halifax could have a climate like that of the Caribbean, when the North Pole is turned away from the sun.



Windbreaks cut the field up into tiny squares in the market garden region south of Avignon.

CHAPTER VI

WITH TRABUT IN ALGERIA

I HAD no idea of going to Morocco without first spending some weeks with my old friend Trabut in Algiers, for to him I owed more in the way of encouragement in the work of plant introduction than to any other foreign botanical friend. There has always been something peculiarly stimulating in the intercourse which has gone on between Trabut and the exponents of plant introduction in Washington, ever since my friend Swingle first visited Algiers in 1899. I was pleased therefore when Dr. Trabut told me one day that it was Swingle, the young American, who had given him, as he expressed it, the faith to go ahead with his work of plant domestication and introduction in Algeria.

I had been in Algiers in 1900, and when I entered Dr. Trabut's gateway with the travelers' palms overhanging it, I found that although the world about it had changed from suburb to city, Trabut's workroom was just the same. What a fascinating mixture of plant materials, books, microscopic apparatus, pamphlets, photographs and herbarium specimens! It was as though he had gone about filling his pockets with everything he saw that interested him and had then just emptied them out on the table and left them there. He had lived in the same house for thirty years. The same tools with which he had dissected the date flowers or torn to pieces the grass palets when he was working on the grasses of North Africa in 1900 he was using still. The same microscope was there at the same simple table. If he wanted to refresh a memory of thirty years ago he had only to turn where he knew his memorandum regarding the event was to be found.

I could not help making a comparison. Since I had last been in that study my government in Washington had moved me, bag and baggage, eight separate times, strewing something or breaking something at every move, and had at last landed me in an abandoned temporary War building which is such a fire trap that brusque policemen are set to watch that we do not smoke, while every week they ring us hurriedly out of our laboratories for a fire drill. It is true that I myself have been a wanderer, but that makes it all the worse. I have never been able to come back to the spot where I last left my belongings. Some one has always moved them about. I often think there is something wrong in the discontinuous life of the average American scientific man. He shifts his college, his post in the experiment station, his rooms in the buildings, his location in the town, his home on the street or his study in his home. He is always just settling down but never does it. I would not claim that one way were better than the other, just different, that's all.

Mrs. Fairchild maintains that until one has been ill in a country one does not really know it, and I am prepared to believe this after the experiences we had in Algiers, where she came down with flu the day we landed, where there are no private nurses and where one cannot get the fresh milk, and particularly those milk preparations upon which American doctors have come to depend so largely for the nourishment of a convalescent.

It was a great surprise to one who had long ago relegated herb teas to the limbo of grandmother's remedies to find them recommended seriously by excellently trained physicians in Algiers, and to discover that my friend Trabut seemed to believe in them also. There are many herbs offered for this purpose in the markets, but the most common seem to be the "tilleul" made of the dried flowers of the Linden tree, and camomile.

As we were driving past the military barracks one day Dr. Trabut told me that when he was a boy of twenty in his home in the Haute Savoie of Eastern France, he had made up his mind to study the flora of Algeria and so had come across to take his military training in these very barracks, still used by the troops. That was nearly fifty years ago and so strong was the feeling against the French then that soldiers going to and from the barracks were often stoned by the natives.

Imagine the pleasure of days spent in the company of a man who not only speaks Arabic and knows the history of every development which has taken place in Algeria in a half-century, but has a lively interest in what little there is left of the cork oak forests, in the hundreds of bulbous plants in the deserts, in every species of introduced tree in the country, in the oasis and mountain and strand vegetation of Algeria, in short who has a universal interest in the whole of North Africa.

It would take a book to record the wealth of information about plants he is so willing to impart to anyone who is interested, and I can only touch a few of the striking things we talked about during the weeks in which Mrs. Fairchild was confined closely to her room in the hotel overlooking the sea, watched over by a charming Russian refugee, while "Monsieur Gra-ham" and I motored about with Dr. Trabut, collecting plant material to send to Washington.

On the very first excursion I learned a point in technique which amazed me, the use of what the Doctor called his *Pioscbe*; a species of light, thin-bladed mattock with which at one stroke he raised out of the ground the deep-rooted perennial plants I had been laboriously getting up by means of a special steel trowel with a stiff back for which I had paid $3.00 to the Cambridge Botanical Supplies Company in Boston. In using a piosche you stand upright and with one hand, without stooping, you can throw out a bulb which is buried eight inches in the sand. Why American and other botanists have stuck to the old-fashioned trowel I cannot quite understand. I came to use the piosche and would hate to collect now without one, although, alas, the splendid one the Doctor gave me I lost on the slopes of the Island of Teneriffe. Dr. Trabut has for fifty years been experimenting in the domestication of plants, and has never hesitated to cook and eat any plant that takes his fancy. This characteristic came out in almost our first excursion when we went in search of *Allium triquetrum*, L. a form related to the onion, with triangular stems and flat leaves, with a milder and a more delicate flavor than the onion. He has cultivated this and improved it and tried with the means at his disposal to popularize it, though I think with little success, as was, perhaps, to be expected. It grows rankly along the willow-lined streams near Algiers and deserves to be studied more thoroughly. The *Scolymus hispanica*, the so-called "Garnina" of the Berbers we found often on the markets, the midribs only of the large spiny leaves being offered for sale. When properly cooked these make as delicate a vegetable of its kind as I have eaten. One wonders why it has never been cultivated to any extent. It is known as the Spanish oyster plant in parts of the Mediterranean region, and its roots too are edible.

Dr. Trabut with his "pioche" beside a patch of *Allium triquetrum,* a mild flavored relative of the common onion of our gardens, a species which he has domesticated in Algiers.

As we drove along the roadway one day a small Arab child stood waving a bundle of some vegetable in his hand, which turned out to be fresh shoots of the wild *Asparagus albus*, L., a native spiny shrub with shoots that are whitish when mature. We took these home and found them delicious as prepared by the hotel chef. They seemed to have a particularly fine flavor and suggested the idea that my friend J. B. Norton might care to add this species to the collection of species of asparagus with which he was working. I took the trouble to look up and get roots of another wild form even more spiny than this, *Asparagus horridus*. I judge from what Norton has since told me that there is still much to be done in the improvement of the cultivated asparagus and these may prove of value.

The Doctor took me one day in February to Cape Matifou, where he knew a wild form of the cultivated beet was growing, (*Beta vulgaris* var *maritima*). Wandering over the barren rocks overlooking the sea, with our pioches in our hands hunting for this wild beet, will always remain a distinct picture of the stay in Algeria. We found the plant at last, and it surprised me by the thickness and fleshy quality of its leaves, which were so brittle that one could break them between the fingers. We discussed the possibility of this form being grown as a pot herb and I sent in some of the plants to Washington. Three and a half years after this event, I happened to meet Norton in the Imperial Valley of California and to my surprise he told me that this same wild beet had somehow or other gone wild in the Valley from plants that had come in, nobody knew how, years ago, and together we searched for and found the dried up remains of a few plants by the side of the highway. Norton has made up his mind that there is a future in the cultivation of this plant as an early green vegetable in the Valley.

It is one thing to go into a new country to collect and dry every new plant for a herbarium and have your responsibility end with the mounting and determination of the plant, but it is quite another to select, out of the hundreds you see, those you imagine may be of some particular use somewhere in your own country. In Algiers, with Dr. Trabut to point them out, I found myself embarrassed with these decisions. There were everywhere pretty or interesting plants that I wanted to see in America. For example, in the interesting Jardin d'Essais du Hamma, which for a quarter of a century or more has been the Plant Introduction Garden as well as a public park for the colony, I was struck by the wonderfully beautiful display of aloes with their tall deep orange spikes in great abundance. Dr. Trabut says these are hybrid forms and that there is a tremendous variety among the seedlings. I have never seen such vigorous gorgeous forms in America, and believe they would be an addition to our collections. There appear to be eighty known species, mostly from South Africa, and some would undoubtedly add great beauty to our Southern Californian and Florida landscapes. There is a wonderful bamboo in this garden from Cochin China, planted as an avenue, *Dendrocalamus macroculmis*, H. de Lahaie. We have tried repeatedly to bring this species alive to America, but always in vain, for the shipping of bamboos is not a simple matter. This is said to come from Hanoi in French Cochin China where doubtless many other forms of timber bamboos are to be sought. It is

A handsome clump-bamboo from Cochin China (*Dendrocalamus macroculmis*), which makes a beautiful avenue in the Jardin d'Essais of Algiers.

a clump bamboo and not one of the kind which spreads through a garden when planted as a border.

I have paid a good deal of attention to the timber and edible bamboos of Japan, and their introduction into America and have often eaten them and given them to my friends to test, so I cannot refrain from giving here an amusing incident that happened in Dr. Trabut's study. I went to call on him one afternoon and found him talking through a speaking trumpet to a distinguished looking old gentleman who held in his free hand a photograph of a clump of Japanese bamboo. He turned out to be none other than M. Richter of Montpelier who in the late eighties was in touch with Dr. C. V. Riley, then Entomologist of the Department of Agriculture and who has been given the credit of being the first to make and use a kerosene emulsion. He was a fascinating man and before I had been talking to him for three minutes he showed me his photograph of what I took to be *Phyllostachys bambusoides*, the commonest of the timber bamboos of Japan. "How can I get rid of it?" he said in that rather feeble voice which often characterizes the hard of hearing. I looked at it, and taking the ear trumpet bawled into it in French, "Why don't you eat it?" You should have seen the amused look on his face! He listened with incredulity to my account of how we had introduced this and the more strictly edible species into America and were eating the young shoots of them just as do the four hundred millions of Chinese and Japanese. The result of this episode was unexpected enough, for I found myself later presented with a young shoot of a bamboo from the Garden, at the close of an address on avocado culture in America, which I was induced to make to the Algerian Horticultural Society [1] and requested by its President, Dr. Trabut, to explain to the audience how a bamboo shoot should be peeled and prepared for the table. I did the best I could, but have no idea that any of my hearers have since tried to eat bamboo shoots. It is not so easy to convert even the most intelligent from conservative ways.

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[1] The Société d'Horticulture d'Algérie by the way is a splendid little organization of which Dr. Trabut has been president for thirty years. It publishes every month the little Revue Horticole d'Algérie which is full of information about African Horticulture.

Dr. Trabut called my attention to a small tree that had just come in from Japan, a new and attractive species of mulberry, *Morus kagayamæ,* with beautiful large leaves suggesting its use as a shade tree. As there are only eleven or so known species of mulberry and as three of them are among the commonest fruit and shade trees of civilized man, the idea of a new species naturally excited his curiosity. Notwithstanding the fact that he had only one small tree in the Garden, the genial Director, M. de Fouceau, allowed me to take some scions from it for trial in America. It may perhaps be classed as a variety of *Morus nigra.*

Over the porch of the office building at Maison Carée, where Dr. Trabut carries on his horticultural work, and where he has hundreds of interesting plants, I noticed *Senecio quadrangularis,* a very pretty climber of the order Compositæ to which curiously enough, belongs the worst weed that has come into Ceylon in recent years, *Mikania scandens*, spoken of in Nicholson's Dictionary as an attractive hothouse climber. It was introduced into Ceylon sixteen years ago and overran everything, but has been found lately by the Singhalese to make good cattle forage.

The so-called Australian pine or she oak (*Casuarina equisætifolia*), so extensively used in South Florida as a windbreak and for decorative purposes because of its marvelously rapid growth, I have never failed to find on every southern strand I have ever visited. In the Algerian Garden this was represented by an interesting hybrid between two hardier species (*C. cunninghamiana* and *C. suberosa*). While in Algiers I was shown four species of this genus, *C. suberosa, C. glauca, C. cunninghamiana* and this so-called hybrid. Later in Ceylon I got seeds of *C. montana* and *C. leptoclada* and *C. rumphii.* There are said to be thirty-five species in Polynesia and Australia, and because of their ability to thrive on seashores and their almost unbelievably rapid growth, they would seem to offer an excellent chance for plant breeding. It is a pity that they are such sad looking trees when young, for when they become really large they take on a stateliness one could hardly believe them capable of from seeing them only during their youth. *Casuarina rumphii* has the finest branchlets (the so-called leaves are botanically branches) I have ever seen—not much larger in diameter than the hairs of a horse's tail.

The breeding of forest trees is such a long-time affair that perhaps it may not be out of place to publish here, for the encouragement of any who may decide to undertake it, the experience of Dr. Trabut who has to his credit a distinct hybrid of the Australian Eucalyptus, *E. Trabutii*, named after him by Henri de Vilmorin. When Dr. Trabut was an interne in the Algiers hospital in 1874 he planted a number of seeds of *Eucalyptus botryoides* and *E. rostrata* side by side. Twelve years later he noticed that among the trees of *E. botryoides* there was one that seemed much better than the others and worth disseminating. He gathered the seeds of this tree and planted them. To his surprise, although some of the seedlings were typical *E. botryoides*, the majority were entirely different, and upon close examination turned out to be intermediate between the two species, in fact true hybrids. The great value of this hybrid consists in its being a much more rapid grower than either of its parents. To prove this Dr. Trabut planted out a row of each species, and after ten years the hybrid had overtopped its parents everywhere, some of the parents looking like stunted specimens beside the hybrid. Dr. Trabut's eucalyptus has been sent to Spain, South America and numerous other countries, where it is said to distinguish itself by its unusually rapid growth. I had the pleasure of photographing the Doctor under one of his original trees, which still stands in the botanic garden of the School of Medicine, having been planted there in 1889 and now being over two feet in diameter. There is another hybrid eucalyptus in Algeria with which this should not be confused, *E. algeriensis*, Trabut, which has *E. rudis* and *E. rostrata* for its parents. This species now covers considerable areas of the forested hillsides of Algeria, and it was an interesting experience to motor through them with the man who first discovered that it was a hybrid and who named it. May thrills such as Dr. Trabut has known come to the tree hybridizers who to-day are starting the work of tree breeding at Placerville in the Sierras of California at the Eddy Tree Breeding Institute!

Whether or not the remarkable specimen of what Dr. Trabut assured me was probably a hybrid of *Fraximus berlandieri,* the South Texas ash, is in reality a hybrid or not, ought to be determined with certainty, for on the rich soils of Algiers it has grown into an amazing tree in twenty-five years. Since seeing it on the Estate of el Thaours (Ancien Sidi Ali) I have visited Brownsville, Texas, and learned that there are perfectly enormous specimens of what I understand is the same species there. Rehder gives the height of this species as ten meters, but the Algerian tree is at least twenty, I should say. Dr. Trabut has tried to propagate this tree by grafting it, since it is an infertile female specimen and cannot be grown from seed. Because of its phenomenal growth he considers it a valuable shade and timber tree in Algeria. The species certainly deserves attention.

Another striking tree that I saw for the first time was a beautiful white-barked variety of poplar called *Populus nigra* var *Tevestina*, Bean, growing tall and perfectly straight on the estate of M. Mannet. It is a variety which I understand was found by the dendrologist Dode near the Roman village of Tevesa. Its bark has almost the whiteness of a birch and is said to be less subject to borers than its relative the Lombardy poplar, which it otherwise resembles. I should think that this tree might be very valuable for planting in our arid and irrigated Southwest.

One of the most spectacular of all the trees in Southernmost Florida is the so-called Portuguese laurel (*Ficus nitida*), some specimens of which have a spread of branches of much over a hundred feet, with aerial roots like those of the famous banyan. To find that this same species of rubber tree is the commonest street tree in Algiers was very interesting, particularly as in Algiers it almost never produces those aerial roots which in Florida seem to preclude its ever being used near a street. In Algiers the leaves of this superb tree are, as they are in Florida, attacked by a thrips which often so completely curls them up as to render the tree quite unsightly. I learned that in addition to this thrips there is a scale insect called the "pou rouge" (*Chrisomphalus minor*) which does a great deal of damage to this interesting tree. Dr. Trabut has observed three forms of this tree, one with leaves somewhat like those of a camelia and he has called it the camelia-leaved form. It appears to be less subject to the attacks of the thrips and scale and has altogether much more beautiful foliage. Thanks to his kindness in pointing this form out there are now young trees of it being propagated from cuttings to test out in Florida and California.

Even before I arrived I had heard rumors of there being a white-barked form of the Chinese persimmon in Algiers, and I wanted particularly to see it in view of the great interest in this fruit in California, and also because years ago when Agricultural Explorer Frank N. Meyer came back from his expedition south of Shanghai he reported the use of a white-barked persimmon species there as a stock upon which were grafted the ordinary fruiting varieties. There are root difficulties with which the persimmon growers of Florida and California have been struggling for years, so it has become important to find this white-barked species again, and I was eager to know if Dr. Trabut had really introduced it. We drove out one afternoon to the estate of M. Mannet near Fondouk and there saw what is certainly a distinct white-barked species of the oriental persimmon, call it *Diospyros sinensis* or some other name, the correctness of which is to be determined. I was reminded as I stood there photographing its white-barked trunk in the wind and mist, of the excitement of dear Meyer when that remarkable Chinese lady Dr. Yamei Kin suggested that the white which appeared in Meyer's photographs might be merely whitewash! The persimmon is much more appreciated in Algiers than it is in France as shown by the planting of several trees of it on this estate.

As we wandered about in this garden we came to one of the few trees of the West Indian avocado that have been planted in Algeria and which, by its excellent condition showed that this fruit could be grown there perfectly well and Dr. Trabut announced to me that his last big drive in the way of introducing new plants was to be on the avocado (*Persea americana*). It was a pleasant coincidence to find a few days later on his doorstep a plant of Wilson Popenoe's Guatemalan avocado "*Itzamna*" which had just arrived from my office in Washington in answer to the doctor's request. This variety of avocado is one of the collection Popenoe made in the highlands of Guatemala and I shall be curious to see if it contributes to the building of an avocado industry in North Africa. There are now nearly 5000 acres of avocados planted in California, which shows what the Californians think of it as a table fruit.

Of the varieties of loquat I got in the Governor General's palace grounds, or the bougainvillea which blooms only once a year, or the gorgeous, heavenly blue cinerarias, of the two new varieties of what the French call "oseille," from which they make their well known sorrel soup, or of *Brassica insularis* which Dr. Trabut thinks, together with *B. Cretica* and *B. oleracea,* were the parents of a triple hybrid resulting in the cultivated cabbage, of the special strain of Alexandrian clover and of the striking flowered *Agave attenuata* of which we got seeds, there is not time to write here, although I am conscious that one of these may turn out to be of more importance than some of those I have described in more detail.

When Dr. Trabut heard that I was going to Morocco, he at once introduced me to Prof. René Maire, who knows more about the flora of its plains and snowy Atlas mountains than any other botanist. To Maire's profound knowledge of the flora and geography of Morocco I owe some of the most interesting facts and plants we were able to bring away with us from our stay there.

CHAPTER VII

THE OASIS OF BOU SAÄDA

It was now the middle of March, and at last the anxiety with regard to Mrs. Fairchild's health had subsided and she began to feel well enough to get out in the car. All the latter part of February and the first of March had been cold and wet, quite changing our preconceived ideas with regard to the climate of North Africa, but by this time spring had begun to bring the asphodels into bloom on the rolling hills back of the city, and how beautiful those hills back of Algiers can be when the almond and apricot trees are in bloom! And what a disappointment were the asphodels! I had never seen them in bloom before and the poet's rhapsodies on "beds of asphodel" prepare one for something far more beautiful than these pale, washed-out looking plants, reminding one in their stiff habit of the tuberose, but without any of the tuberose's beauty or perfume. Yes, the asphodels were a disappointment. Later on, in Morocco, we were to see the fields a blaze of beauty, but now we saw only the delicate shades of green and pink and white such as mark our own northern spring, and many of the same species of plants. There is nothing tropical about Algeria. It is a region of cool winters like the coast of California, but with a summer temperature which is much higher and more trying I should judge. Coconuts cannot grow there nor can the mango ripen its fruit, while the sapodilla and papaya, which thrive so splendidly in Southern Florida are unknown in the gardens. If anyone is looking for a region on the other side of the Atlantic where he can play out of doors all winter long in his shirt sleeves he will not find it anywhere short of Senegambia on the Coast of Africa, or Ceylon.

The weather was delightfully bright and comfortable, however, so packing "QQ" we shot out over the road to the little Oasis of Bou Saäda. The highway was good but wound in and out through the mountains and we at once ran into a fog so thick that it was difficult to see far enough ahead to anticipate the curves and tell when to turn the nose of the car in or out. As we were driving along we met a man on horseback, dressed in an incomparable white costume with red turbaned cap and accompanied by a servant. He hailed us and begged a ride, saying he was the Cadi di Sidi Aiosa and in a hurry to get to a neighboring town where he was to hold court. It seems to be the practice to beg rides in Algeria—any well-dressed Algerian may hail you as you pass, and as there are few cars the reasons for stopping are more real than they are on the roads of our own country. There is a novelty in having squeeze into the seat beside you a white woolen mass of humanity with whom you can only talk indifferently by means of signs and the few French words with which you both are familiar. I could not help thinking that the dignity of this Cadi compared very favorably with that of such American judges as I had met, and certainly he was more picturesquely clad. When we came to his village our friend insisted on our getting out and drinking coffee with him, thick, sweet Arabian coffee, served in tiny cups.

At Aumale we lunched, and as it was the first interior town in Algeria I had been in since my last visit I was glad to look around. It was evident that French ideals had prevailed in the building of the town, even to the planting of elms, sophoras and *Ligustrum japonicum.* The elms from Europe, the sophora (pagoda tree) from Japan or China, and the ligustrum from Japan—all being introductions from foreign countries. When I hear people contend for the development of a country with only its own trees and shrubs my mind goes to Aumale and I wonder whether the little town is any the worse for the foreign trees shading its streets and doorways from the glare of the noonday sun.

I don't believe any of us will ever forget the first glimpse of great desert stretches which broke upon us as we slid down from the mountains onto the plains leading to the oasis of Bou Saäda. It was not the rolling sand desert of the Sahara, for here and there over the dry ground were the most miniature little plants I ever saw, in full bloom. There was a dwarf form of *Iris alata* not over two inches in length, even including its tiny bulb. We longed to transplant it to America, where of course it would not behave at all as it did here on the sun-baked soils of the desert.

Photographing some of the diminutive desert plants on the way to Bou Saäda.

A desert Erodium with its perfect little flowers scarcely three-quarters of an inch above the soil was irresistible with its delicate pink petals, and a brilliant dwarf Calendula with its penetrating orange-colored flower head, raised scarcely a half-inch above the desert rocks, together with a tiny crucifer not much larger, with light yellow flowers, composed the flowering plants about us. The slender grass-like leafy tufts of an interesting bulbous plant, *Romulea bulbocodium* although not in bloom attracted our attention because there were some Arab sheep herders digging them. Graham and I investigated and discovered that below each tuft of leaves there was a small bulb as hard as an onion, and according to the signs the shepherds made, this was good to eat. They were tiny things, but it was fun to dig them up and tie them together in bunches and imagine attempting to cultivate them somewhere as a crop for the tables of American gourmets. I did send a quantity of them to Washington, but have no idea where they could be grown, unless it be somewhere on the deserts about Indio, California.

Reluctantly enough we left our roaming over the dry rocky hillsides, our first excursion in Africa, and pushed on to the oasis. There are times when the conditions of life are so perfect that you are tempted to say as Faust did to the Devil:

> Werd' ich zum Augenblicke sagen
> Verweile doch! du bist so schoen!
> Dann magst du mich in Fesseln schlagen
> Dann will ich gern zu Grunde gehn!

It is not the Devil who moves you on when you are traveling in your own car, it is the setting of the sun and the coming on of night. What a strange thing it is to realize that with the approach of the great shadows, multitudes of men, like stalks of grain during a storm, lie down, to rise again when the shadow passes and morn comes on. Out of the thousands of memories of days with their thrills somehow that first day on the desert stands out and refuses to be treated without emotion.

I venture to state that unless you have had your ideas changed by reading the Geographic Magazine, an oasis is not what you think it is, any more than an atoll is what your imagination has painted it to be. Bou Saäda is no exception. It gives you the impression of being simply a town with a trickling little stream which has made a deep ravine flowing through it. Coming onto it from the desert it is fascinatingly interesting, for the signs of life increase so fast. The robed horsemen, the donkeys with their riders sitting far back on the rumps, the women on foot carrying things on their heads, and the camels, make a confused mixture of new forms and colors.

Perhaps as a boy you watched the circus parade pass, and gasped as that impossible beast called the camel went by, wondering if you might ever come to understand it better, but you will not, for the camel is a beast that allows no one to make its acquaintance. Its unapproachable air of superiority never deserts it. I think the Arabs' own description of this hauteur is illuminating, for they say that whereas the Arab knows ninety-nine of the most beautiful attributes of Allah, only the camel knows the hundredth one.

Bou Saäda was in its prime. The apricots and almonds were in bloom along the "oued," or stream. There was a tiny garden, irrigated of course by open ditches, right behind the little hotel and when I parked QQ, I ran her under an apricot tree in full bloom and the petals fell in showers upon her. From our window we could look across the oasis and out to sea, as it were, by which I mean out upon the sand dunes surrounding it. Bou Saäda had not long been opened to tourists and we had the oasis to ourselves and were able to wander about its dusty, narrow, mud-walled streets and through the markets where every date or pepper seller sat on the ground and watched the pile of his goods before him. What filth! There would seem to be enough in the way of human ordua blown about by the desert storms to infect everything man eats from day to day in the oasis. And if these heaps of filth were not enough, there are the sore eyes and legs and other diseased parts of exposed bodies around which the flies are always swarming, enough of them to insure every person's being visited many times by flies that have never wiped their feet.

I remember the early experiments of the bacteriologist who let a fly walk across a gelatine culture plate and proved by the colonies which developed when the plate was incubated that every one of the fly's six feet had been filthy when calmly, without thought of the show-down that was coming, it walked across the smooth gelatinous surface. How long does anyone think it would take a gelatine plate to be contaminated in the oasis of Bou Saäda? It is an education in the fallacy of the first germ theory, the theory that the germs themselves were all powerful and one's only hope of health was in never being exposed to them. It is certainly your own high threshold of resistance that you bank on as you walk about through these dirty places and are even brave enough to try some of the dates which look as clean, and probably are as clean, as those offered on the streets of New York. Years ago, when I was in Bagdad, I learned that tramp steamers came into the Persian Gulf, loaded thousands of tons of fresh sticky dates and took them direct to New York. Now I knew that these dates were, many of them, packed by workers who had smallpox and every other kind of Oriental disease, and in the packing they used hands and feet which were never washed, and even bit off the dates from the stems with their teeth. I became alarmed for fear these dates would carry to the children of New York the worst diseases of Arabia and that the little ones would take in with their Thanksgiving dates all sorts of bad germs. I reported the matter to the Surgeon General of the Navy. "Do you know," he said, "I used to be alarmed myself, but we have carefully examined hundreds of the sticky dates for any disease-producing forms of bacteria and have never discovered any. Nor can we find any evidence that they have ever started any epidemic of smallpox or dysentery or typhoid or anything else in America. We have no evidence that they are unhealthful, though we know they are not clean of course. The sugar in them seems to sterilize them."

One with a philosophic turn of mind soon comes to the conclusion that while one is of course running dangers in eating dates, these dangers are, after all, not nearly so great as the dangers which accompany automobiling. Graham and I had just a few days before witnessed a most ghastly affair in which seven persons were injured when their car backed over a steep bank and rolled down the slope two hundred feet below. We had taken the most seriously injured to the near-by village, expecting them to die on the way. We were, therefore, more than usually aware of automobile dangers, and the invisible germ dangers did not seem to appeal to us particularly. Even when we saw the milkman of the town carrying the milk supply in bags made by tying up the legs of a goatskin, just as was done in the Fifth Dynasty of the Egyptians, we were conscious of the fact that, if during six thousand years humans had drunk this filthy milk and lived to be fourscore years and ten, there was a certain chance that even we might have strong enough stomachs and intestines to withstand the attacks of any germs which the goatskin milk bottles contained. This is at least about the only attitude one can take, if one expects to be comfortable in one's mind, when in the oases of the Sahara, where doubtless the sun is a great germ killer.

The oleander grows wild in Algeria and is often the only living plant in sight on the sand dunes near the Oasis of Bou Saäda.

I did not find much that I wanted to send back to America during the few days spent in Bou Saäda, but we got warm in the bright sun, which one cannot do on the rainy winter coast of the Mediterranean, and I saw for the first time wild oleanders growing in the sand dunes. I had come to associate the oleander with the seashore or with tub culture. I had not thought of it as a great desert shrub and I imagine there are many of those who know it in California, where it is generally irrigated, or in South Florida where it grows best right down near the sea, who would be as surprised as we were to find vigorous bushes growing where they were the only signs of vegetation in a sea of pure sand. They have none of the apparent xerophytic characters exhibited by cacti. The great inventor Edison told me last winter that in his search for rubber-producing plants he had found that the old leaves of the oleander contained a good deal of rubber but that when you cut the plants back in order to get a fresh quantity, the new leaves appear to contain little or none of the rubber substance. I doubt if we know much about the oleander yet, save that its juice is so poisonous that people have lost their lives by eating the flowers and that once a whole family was killed by using the peeled stems for meat skewers. *Nereum oleander* seems to be the common ornamental plant, although *Nereum odorum* is the fragrant one. The books report other species in the mountains of Persia and Arabia, which ought to be introduced.

Much use is made of the so-called cane in the Mediterranean region, where the grape and tomato trellises and all sorts of cheap baskets are made from its smooth bamboo-like stems, but it had escaped my attention until Dr. Trabut spoke of it that there is another species than *Arundo donax,* the common cane, and a much more serviceable one, *Arundo Pliniana,* Tarr. with smaller stems, one that does better in dry lands and is a native of the Sahara. In the suburbs of Bou Saäda I saw gardens where this species was abundant, and I have taken steps to introduce it into our own Southwest.

Looking back upon the occurrences of the stay in Bou Saäda there is one that stands out above the others. I had heard of the lifelessness of the sand dunes so I was interested to notice little pellets of moistened sand, scattered around what I took to be the holes of some insect, so I started to excavate one of these holes.

I had swept away the sand for several inches with my hand when I detected, sticking out of the wall of sand which I had made, the tiny snout of some animal. As it did not move I carefully dug it out and at last saw before me a perfectly motionless, light pinkish yellow lizard with large brown eyes. It posed until I could photograph it, then Graham took it to the hotel and observed that at night it became quite lively, from which he concluded it might be nocturnal. We visited the dunes at night, he and I, but were not rewarded by finding any animals about. The tiny pellets of moist sand turned out to have been made by a species of spider which brought them up from its burrow at least a foot below the surface of the dry sand. These occurrences were of no particular moment, one might say, but they were of a kind which somehow or other, get themselves remembered. They are quite as vivid in my memory as the events connected with our visit to the Mosque of El Hamel where we motored to be present at a sunset ceremony, the occasion of which was the arrival of a holy man, a Marabout from Biskra, who drove up while we were there. We had parked QQ right in front of the Mosque and had been seeing the town with the secretary of the Marabout, Sidi Bel Kassem, an inquisitive fellow, much impressed by the great number of inventions which came out of America and I had begun to describe a new electric lighting plant which a friend of mine had just put into his house in Florida, when the Marabout from Biskra arrived. We were permitted to assist at the evening ceremonies, a thing I had never before been allowed to do. I cannot see but that the ritual of this ceremony, with its attitudes of submission shown by repeated bowing down and touching the forehead to the ground, is quite as convincing as that of any other religion. After the ceremony we waited to meet the son of Sidi Bel Kassem who gave us tea and was very hospitable, but the feeling of religion had departed with the last strains of the chanting. We returned in the evening light, watching the daylight fade on the delicate white and pink blooms of the apricots which every Arab garden seems to have, and which are the most striking character of the landscapes at this time of year.

The sheep market was on in Bou Saäda in a special square or enclosure, and the tribesmen had come in from the hills, each with his sheep to sell, and next morning as we wandered about through the hundreds of really very fair specimens of ewes and rams I could not help wondering what would have furnished the food of the Arabs had they, like the Hollanders, taken a dislike to the odor of mutton and goats. It certainly seems fortunate that they did learn to eat the flesh of sheep and that the great prophet did not make mutton taboo instead of pork, for hogs would have had a much harder time than sheep in making a living on the desert hillsides of North Africa.[1]

We returned to Algiers and prepared for our run into Morocco by having typhoid injections, and took one last ride along the roadways which wind back and forth on the hills behind the suburb of Mustapha Superieur, overlooking what is now a perfect mass of tall and very good-looking apartment houses with the beautiful harbor in the distance, and a run out to the zoölogical gardens with Dr. Trabut to see a strange sort of the ordinary turkey which his son had discovered—a gobbler with a large tuft of feathers arising from its *head.*

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[1] In that part of the Koran called The Chapter of the Table wherein is described the miracle of the table which was let down from heaven for Mohammed and his Disciples to eat from, and over which there has been endless discussion as to what viands were on the table—occurs the swine flesh taboo, also "that on which the name of any besides God hath been invocated, and that which hath been strangled, or killed with a blow, or by a fall, or by the horns of another beast, except what ye shall kill yourselves, and that which hath been sacrificed unto idols." That such a taboo has for centuries prevented millions from touching good food is a matter for reflection.

CHAPTER VIII

THROUGH ALGERIA TO MOROCCO

We had hoped that perhaps Dr. Trabut [1] could go with us to Morocco, but his duties forbade his attempting it and Dr. Maire was still tied up with his classes, so we were obliged to push on through the Cheliffe Valley alone. It was on March 20th that we set out for Blida, the weather was uncertain and just as we approached the town and passed into an avenue of the *nivea* variety of the white poplar (*Populus alba* var. *nivea,* Ait.) it began to rain and the white shimmer of the leaves made them seem to be covered with white blooms. Every time our minds went back to the struggle we had had to keep warm over our tiny fire in the hotel we were pleased with each passing day that brought us nearer to warm weather.

We had heard that en route to Oran there was a little hotel in the mountains above Blida near the Gorge of the Oued Chiffa, where wild monkeys came down and played about and which was known as the Ruisseau des Singes. We drew in there late in the evening and were shown to rather cheerless rooms with balconies overlooking a mountain stream that lulled us to sleep with its rush of waters. In the morning as we were dressing we happened to look at the window and there was a little monkey peering in at us while another was climbing down from the roof by way of the iron upright which supported the balcony. The yard seemed suddenly full of them. As is their custom they had come down from the mountains near-by, where there must be thousands of them, to get their usual breakfast from the guests of the hotel. It was a strange experience to have them crawling all over the car, peeking into the windows and then scrambling away into the overhanging trees. They were tame enough to take food from one's hand, but not to allow anyone to handle them, and Graham had a wonderful time watching their behavior. I doubt if there is any other place so near to civilization where such a number of monkeys can be found tame enough to be approached so closely, and I wrote to my friend Dr. Robert M. Yerkes suggesting that he visit the place for the purpose of studying their habits. He has been for several years working with the remarkable collection of anthropoid apes which Madame Abreu of Havana has collected. These at the Ruisseau des Singes are not anthropoid, but are the short-tailed Barbary Ape. As we were watching a pair of them on the low wall near the hotel, Mrs. Fairchild noticed that the female had in her arms something black which she carried with her wherever she went, and we enquired of the hotel waiter if she hadn't stolen something from the kitchen. "No," was the reply, "that is her dead baby. Don't you see it is black? It has been dead for a long time. Some of the females throw their dead away at once, but this one has carried hers about with her for a week or more." It was hard not to believe as we saw this pair sitting on the roof together, male and female, she with her dead baby clasped to her breast, that he was trying to comfort her over the loss, and that she was refusing to be consoled. What would be the explanation of either Kohler, who studied apes in the Canaries, or of Yerkes, I do not know.

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[1] Since returning to America, we have learned with sincere regret of the passing of this great pioneer in Plant Introduction.

We spent so much time with the monkeys that we got a late start from the Ruisseau des Singes and the steep climb along the slopes of Mt. Zaccar slowed us down so that we arrived at Orléansville after sunset, only to find that there was a tennis tournament on in the town and the hotel full. "What are you doing, traveling after dark, Monsieur? Don't you know that people do not travel after sunset here? It is not done, Monsieur. I am sorry I have no place at all for you." We had noticed that people did not travel either in automobiles or in any other way at night and we had come to rather enjoy having the roads to ourselves, but this time we were caught. Farther on at Charon, a small village, there was a little hostelry where they thought we could, perhaps, put up, so we pushed on in the darkness. A group of peasants in the combination bar and dining room stared at us and wondered what kind of people we were, arriving in the middle of the night, and we needed all the polite French at our command and all our powers of persuasion too, before we were accepted, and at that we had all three to sleep in the bedroom of the owner and his family.

The hotel owner was a congenial spirit, a "colon," as the French colonists call themselves, and so we were rewarded for our discomfort by having a real glimpse of pioneer life in Algeria. How different it has been from the life of the pioneers in the Imperial Valley of California or the Yuma region of Arizona! Algeria was densely inhabited when the French came in 1829, a century ago, while Arizona and California were practically uninhabited or very sparsely settled when the "forty-niners" first streamed in there. The presence of cheap labor in Algeria has made it difficult to develop an extensive use of power machinery, while the absence of it has taxed the wits of the pioneers of the Southwest and resulted in a use of labor-saving machinery such as the world never dreamed of before. Then, too, compare the tiny parcels of land, eight to twenty-four acres, which the first pioneers in Algeria were allotted, with the vast tracts of territory the aggressive pioneers of our great plains secured. The French colon came to an agricultural country that had been highly cultivated in Roman times and was still a rich country during the Middle Ages, but which had been brought to the verge of ruin by the brutality of the Turks, while our Southwest was virtually virgin territory.

To realize how old Algeria is, one should see the ancient and extensive oil mills of the Romans and peer into the immense olive oil jars that now decorate the dooryard of the hotel at Tipaza, and visit the ruined cities the Roman legions built.

Two things in particular gave me the sense of living in the hoary past. One was to realize that the goatskin water bag in common use was an invention of the people of early Egyptian times and the other was to know that over an area of more than ten million acres of the Steppe region of Algeria, Arab men, women and children are still pulling out the hard fibrous leaves of the alfa grass, which in ancient times were made into cordage and yarn, but which to-day furnish the finest paper pulp known, and that they are working with the same special tool and technique as in the time of Pliny. Political changes of the most radical kind have swept like clouds over the land but they have not greatly altered the everyday life of the Arab. He and his family still pull alfa on the steppes in the same old fashion, and when they are hot, drink water out of a goatskin water bag. I am speaking now of the country Arabs, not of the city ones, who seem to have taken on all the superficial polish of Europeans.

As I strolled about the little town of Charon in the morning sunshine the Arab donkeys were bringing in loads of leaves of a dwarf palm (*Chamerops humilis*) to be baled for shipment to the factory in Toulouse where vegetable hair is made. Naturally I thought that the utilization of this palm was an Arab industry, but according to Dr. Trabut this is not true. When the first French villages were established in what is termed the Sahel, the region of low hills and mountains bordering the sea where the dwarf palm covers square miles of ground, there were times when their meager concessions were not sufficient to support the lives of the colonists and they made enough money out of the leaves of these palms to tide them over the dark days.

Charon is in a region of artesian wells and out along the splendid avenue of magnificent forty-year-old eucalyptus trees I found a typical irrigated garden with its pump house and well in the middle of the land, and around it patches of cabbage and broad beans. There was a planting too of cotton from which last year's dry stems had been cut. The owner was growing his cotton as a biennial, leaving the stubble in the ground to sprout and produce the second year's crop. The mild character of the winters in parts of Algeria makes this possible, whereas the winters in the cotton areas of America are as a rule too cold. The Algerian cotton grower has a serious climatic difficulty to overcome wherever he tries to grow cotton without irrigation, as the rains on which he depends to sprout his cotton seed come in the spring when the weather is still too cool for the seeds of the cotton, which is a tropical plant, to grow, and by the time the weather gets warm enough for them the rains have ceased and there is not sufficient moisture in the surface soils. Varieties are required of which the seeds will germinate in cooler weather than do those of the common cotton.

I am often asked whether France is going to grow her own cotton and become independent of America, from whom she now gets her cotton. It is a large question, and one upon which the French experts have been working for years. It is a curious fact that of the varieties of cotton now being extensively tried in Algeria, Tunis, Morocco and in the Lake Chad region of Senegal, those which have shown the most promise are the Pima and Yuma, two varieties originated by my friend T. H. Kearney in Arizona, using as his first stock some seed that Mr. Barbour Lathrop and I got in Cairo in 1899. It should not be forgotten that Algeria once had a thriving cotton industry, and that there are native species of cotton in Morocco. During the Civil War in America and immediately after it, the amount of cotton produced rose to 744,158 kilos, but when the American cotton fields were rehabilitated its culture in North Africa was almost entirely abandoned.

As I was poking about the little town with the owner of the hotel, a picturesque Arab with a very intelligent face came up to him to ask some question, and I enquired what he did for a living. "He grows *pasteques* (which is the French word for watermelons) on shares for a friend of mine," was the reply. I was reminded that I had never seen watermelon served on the table anywhere in Europe, except in Spain and Italy, while the Arabs are quite as fond of it as are most Americans. Just why Europeans should not appreciate such a perfectly good fruit it is hard to understand until you spend a summer in Central Europe where the cool weather seldom gives you the dry thirst we acquire so easily in America and which is one of the greatest preparations for a watermelon orgie. Feeling drawn in a peculiar fashion to this watermelon grower, the first I had ever met outside of my own country, I promised to send him some "Tom Watson" seed when I got to the yacht, where I had an assortment of our best garden vegetable and field seeds. I sent them to him later, and hope some time to go back and eat some of his melons.

As we passed out of the little town of Charon we saw our first stork's nest perched on the chimney of a farmhouse just above our heads. It is always a strange sight to an American—that of this great awkward bird, building its nest as though it were quite as much one of the family as the dog or cat. I remember later in Morocco seeing a village where eight storks were nesting, all in sight from the car at once. We can hardly be said in America to have a domesticated bird of this kind and it seems a pity too. The great blue heron comes the nearest to being such a household pet. We had chosen the interior route from Algeria to Oran rather than the more picturesque corniche because we wanted to see the farming regions of the fertile Chelif Valley, surely one of the loveliest valleys in the world, the road running for forty miles or more along the Oued Chelif, one of the larger streams of Algeria. There are no such rivers there as the Rhône or Loire.

On this gorgeous morning in March, round a turn in the road we suddenly saw in the distance the famous fields of calendula. One sees bedding plants solidly put out for the production of mass effects in city parks; one is accustomed in America to fields of mustard or abandoned pastures overrun with daisies, but to see a hundred acres of deep orange calendulas in full bloom is to experience one of the real thrills of North Africa. We drove toward the field and got out. We waded nearly knee-deep in the blooms and soon found we were not in a pure stand of calendula but in a remarkable mixture of five species. The *Calendula arvense* gave the deep orange tone, the wild mustard furnished a sulphur yellow, a species of mignonnette, *Reseda alba* added a straw color and a touch of pink, while a Borrage and the heavenly blue *Anagallis arvensis* furnished a note of blue. I have never felt so completely immersed in flowers in my life as I did that morning in the Chelif Valley.

As the evening approached and we neared the outskirts of Oran we suddenly became conscious of a delightful fragrance which we found came from bushes by the roadside whose white blooms were scarcely visible in the twilight. We gathered some of the branches and I recoginzed it as "Retama" (*Cytissus monosperma*), a lovely thing we had seen offered for sale in a Parisian florist's shop at Christmas time. I wondered what the bush was doing on the coast of Algeria. As it turned out, this plant proved to be one of the most interesting of the many we studied during the Moroccan journey, for it is one of the best of the sand binders for the reclamation of sand dunes and I shall have occasion to return to it.

In 1900 I had botanized around Oran with a French geologist, Prof. Doumergue, so next morning I looked him up and we talked over the day twenty-eight years before when we had gone out and found one plant of *Medicago orbicularis,* the same species that my friend Kearney picked up in the ruins of Timgad, which has since become a common species in the uplands of California, contributing substantially to the sheep pasturage of that region. To Prof. Doumergue the occurrence was merely an incident, to me it had been a great event, this finding of just one single dried-up plant with a few seeds on it that I had come so far to seek.

I also called upon Alfonse Faure, a teacher by profession but a botanist by choice. When his classes are over he amuses himself with his herbarium or makes excursions into the fields to find some new representative of the many interesting forms occurring in Western Algeria. How often one finds among the so-called amateurs of science men who have contributed vastly more to the world's store of knowledge than the general public appreciates. I was interested in Hedysarum, the genus to which the forage crop sulla belongs, because in 1901 on the Island of Malta I had seen everywhere great bundles of sulla hay (*Hedysarum coronarium*) which the peasants were harvesting off their narrow terraced fields, where a thin soil not over six inches deep covered the calcareous rocks. Although this interesting crop has not yet been a success anywhere in America I still believe that, were the proper crosses made of it with some of the other hedysarums, of which there are seventy species, all in the north temperate zone, reaching even into northern Canada, a new and valuable drouth resistant, lime-loving crop could be produced. So when I knocked at the street door of M. Faure's house and his charming wife asked if I would not come in and consult his herbarium and wait until M. Faure returned, it was with the hope that I might find in his collection some representatives of the hedysarums of which there are eleven North African species described in Trabut's flora. The sheets were full of beautiful specimens of hedysarums and when a few minutes later M. Faure himself came in, he most generously supplied me with duplicate specimens and later sent me seeds of those I particularly wanted. He told me of very rare species in the Atlas mountains, one of which I had the pleasure of seeing later, and he directed me to the place where I afterwards found various species of the retama, all of which are of value as sand binders.

We spent the next night at Sidi bel Abbes, a town less well known perhaps as the great cereal center of Algeria than as the headquarters of the French Foreign Legion. We had intended to make Tlemcen the following day but we did not stop to think, most travelers don't, that the same vicissitudes of nature exist, no matter where one is on the surface of the globe, and when we were ready to leave Sidi bel Abbes, the hotel manager informed us that we might not be able to get through to Tlemcen as the bus had found the snow too deep in the passes and had not been able to make it the day before. We had all of us been long without seeing snow, and we had great confidence in QQ. Furthermore, it seemed an inviting experience to run into a snow storm, so we gaily waved the hotel keeper adieu, saying we would try it anyway, and pushed on over the road to Tlemcen.

I have nowhere in the world seen such stacks of straw as one does in the region of Sidi bel Abbes. They are huge affairs, hundreds of feet long and twenty feet high, some of them were covered with a layer of dried clay plastered on to keep out the moisture. I wonder if they are new inventions or have come down from Roman times. They made me think of Renato, an Italian boy whom I once hired as a gardener. He broke every tool on the place, let the horse run away, and destroyed one of my best flower gardens, but he did teach me the Roman trick of maturing a manure pile by covering it with an airtight layer of dried mud, making it look just like these great haystacks of Algeria. I have often thought Americans did not use dried mud as much as they might; lumber is cheap and we have the hammer and nails habit.

We were approaching the extension of that great range of mountains, the Snowy Atlas, which reaches its greatest height south of Marrakesh, and at 600 meters altitude, which is 1950 feet, we noticed a light fall of snow on the roadsides. As we climbed, this deepened until, at a little past station called Decartes where we stopped to find if we could get on, we were plowing through snow a foot deep. It was an exceptional storm. With considerable excitement the Post Commandant showed us a house of which the roof had been broken down by the weight of the snow, and took me into his garden to show me his pet fruit tree, a Japanese loquat, the limbs of which had been broken down to the ground. This was on the 25th of March. One gets accustomed to hearing in Switzerland that the passes are closed, but what American would ever think of there being too much snow on the passes of Algeria! We were forced to detour, and in detouring we floundered in more than one way. We floundered in the snow and had to be dug out, and we lost our bearings and had to put up at the most uncomfortable hotel it has been my lot to sleep in for many a year.

I think it is just as well that once in a while one has to stop in an old-fashioned inn such as Alexandre Dumas describes so vividly in his Three Musketeers, for it gives one a very good idea of the discomforts the men and women of a former generation were accustomed to. It is the incredibly bad sanitation that offends the American sense of propriety. Put in bathtubs, and most of all, modern sewage arrangements, and most French inns with their excellent cooking would have a distinct advantage over the little American hotel. But cold! The damp cellar-like chill of the bedrooms which no fire had ever warmed, makes us remember this little place which otherwise we should have completely forgotten, and whose name I purposely refuse to reveal.

It was not until we were really on the road again and heard on all sides more details of the great storm that we realized we had run into the tail of a severe winter hurricane such as had not occurred in twenty years. Great eucalyptus trees almost barred our path over Mt. Tessala and the avenues of carobs had been blown to pieces, so instead of our arriving in Tlemcen and finding it the quaint Oriental town we had read about, we found it a city of melting snows and mud, with here and there olive trees across the road and everywhere signs of the storm. This was not by any means what we had come to North Africa to witness, we could see this in Washington in any March, so we kept right on toward the border of Morocco with the idea of reaching Oujda that evening.

CHAPTER IX

FROM OUJDA TO FEZ

WHEN you cross a state line in the United States the children give a faint yell, say something about our now being in another state and that is all there is about the experience, but when you enter a country about which you have heard so much that is romantic and you realize that some of your friends have advised you not to try it with a car, and others not to go there unarmed, your pulse beats faster as you approach the moment when your car will bring you to its border. We were, it must be admitted, a good deal worried about the *pistes* or trails on which our French friend had warned us we might so easily get lost. We did not know what those pistes would look like, but we felt sure that they would not bear any signs on them. The dusk was

FES.....17K
MEKNES 77K

How could one get lost on the roads of Morocco with such sign posts as this?

gathering as we slid over from Algeria into Morocco, and there at the side of the straight, well-made highway stood a concrete sign eight or ten feet in height on which in great black letters a foot high was given the number of kilometres to Oujda. We looked at each other and laughed. As a matter of fact, Morocco is the best signposted country I have ever seen. You might get lost going the forty-five miles from Baltimore to Washington, for there are few and poor signposts, but you could not possibly in driving from Oujda to Mogador, a distance of 625 miles. Even the sign boards of the Texas and California roads seem amateurish affairs, carelessly put up, when compared with the cement signposts of Morocco which you can read when speeding fifty miles an hour.

We arrived in Morocco at the very beginning of the Rif war, but we did not know it and so it made no difference in our plans. Could we have foreseen how soon the regions we were going through would be fields of operation perhaps there would have been an added thrill.

Our letter from M. Terrier to the Governor General was an open sesame such as I have seldom carried, and there were awaiting us at the customhouse the most cordial letters imaginable from the Governor himself, the great Maréchal Lyautey. I have traveled in other countries with high official papers but have generally found them something of an embarrassment for they have entailed many functions, and have curtailed my freedom of travel. In both of these respects the papers which Maréchal Lyautey sent to us were the best I have ever carried.

We had not been within the borders of Morocco ten minutes before we saw something that struck us as remarkable. We found ourselves traveling through miles of newly planted avenues of shade trees, trees that had not merely been stuck in the ground and left to struggle for themselves as have so many of the avenue trees on our own Southwestern plains, but that were being attended to by Arab workmen. Their trunks were protected from the goats by exceedingly thorny branches of the wild jujube (*Zizyphus lotus*) tied around them, and they were being irrigated. Some of these avenues were seven and more miles long. There were avenues of carob, and mulberry, and olive, of black locust, and elm, and judas tree, of honeylocust, and poplar, and *Eucalyptus rostrata,* and *Sophora japonica,* and even of the china berry tree, and the vile-smelling but rapidly growing Chinese tree of Heaven (*Ailanthus glandulosa*).

The French had been only twelve years in Morocco, they had been engaged in the World War, and in Morocco itself their mandate had been contested by the Riffians, yet here they were, planting what amounts to over a thousand miles of avenue trees, which, even while the peace negotiations were going on would be growing, and slowly but surely converting their military roadways into shady highways like those of France. Later, when I had the pleasure of meeting the Maréchal it gave me much pleasure to refer to this planting of the roadways. If he had not done one other thing than to encourage the planting of the Moroccan highways with trees, his name would deserve to be remembered in a peculiarly grateful way by the future generations of

The French know that to make an avenue, one has not only to plant trees, but to water them regularly as well.

peoples who will have to traverse these heated roadways under a scorching sun.

Can you imagine a country approximately the size of the state of Texas having five and a half million human beings in it without any railroad worthy the name? Such is Morocco, for, according to the agreement of the 4th of November 1911 between the Germans and the French, no commercial railroad line could be built. This convention did not prevent the construction of a narrow-gauge road for the carrying of military supplies, however, and the tiny little train of five diminutive cars puffing along, with Arabs sitting all over it, much amused Graham. Since 1918 a new program of railroad building has begun, and while even the new railroads being built look feeble to American eyes, they will carry as large cars as are commonly used on the Continent of Europe. But thanks perhaps to the German-French agreement, there is a network of roads having a length of over 2600 miles. It is true that these are not cement or asphalt highways, but the cheap Arab labor makes it possible to maintain macadam and dirt roads in a very fair state of repair. They are as straight as the monotonous roads of Florida, on which if you don't take care you will go to sleep, but you can make fifty miles an hour on them easily enough, while between Rabat and Marrakesh they stretch away forty miles without a curve of any kind, making it possible for the large buses crowded with Arabs to boom along on them at a high speed. Roads and automobiles have solved the transportation problem in Morocco and, from what I saw of them, and the extensive roadside tree planting that is going on, I should not be surprised to be able, in twenty years, to travel as one does now in France, through a thousand miles of shaded highway. I could not help wondering where in America there would be a thousand miles of such avenues in the next twenty years for we have no system whereby adequate provision for the care of our highway trees is secured. I suppose the tired Arabs who will go to sleep under the shade of these trees will forget that the French planted them, and long for the days of what their malcontents will call freedom. When one compares the conditions of the agriculture of Algeria before and after the occupation by the French how can one fail to see a general improvement for the Arab as well as for the French colon?

In Oujda one is well within the confines of Morocco and begins to feel at once that he is in a country but recently come under the hands of civilized administrators. The old town with its turrets where, until thirteen years ago the heads of transgressors were hung up to rot in the sun, was our first glimpse of a type of civilization with which we were to associate for the next three months.

One has to change tires in Morocco as well as in Arizona, but the audience is very different.

Thanks to the courtesies of Monsieur de Witasse, the Consul de France and Chef de la Region d'Oujda and to Monsieur Ribrol Inspecteur d'Agriculture, Oujda, our entry into Morocco was not without some degree of instruction in local matters. We made a trip with Monsieur Ribrol to Berkane in the land of the Benisnassen, where we could look over into the lands of the Riffians. Of course we knew nothing of the impending attacks which they were contemplating, but nevertheless it was interesting to look into a country that has never known anything but a despotic government, has grown up outside of any real European influence and has been swept, since its earliest unwritten history by tribal warfare. It is, indeed, wild man's country.

Through the literature which Monsieur Ribrol put in my hands I began to learn something of the resources of this new country. What a confusing thing it is at first to get a glimmering of the intricacies of such a complicated thing as an old country like Morocco. You know that your experiences in it are not likely to have any relation whatever to those condensed tables of statistics which form the libraries of most diplomatic and consular officials of all nationalities.

You read that Morocco produces ten million quintals of barley and five to six of durum wheat and only 700,000 of maize, with lesser amounts (almost none) of rye and only 20,000 hectares are planted to soft wheat; and oats and millet and horse beans and garbanzos and lentils and fenugreek and coriander and cummin. You see that since 1912, 4000 acres of vines have been set out, and that there is an export of 9,000,000 frcs. worth of almonds and that the olive tree is grown about Fez, Marrakesh and Meknez. You see that there are now about 1,200,000 head of cattle, 7,000,000 head of sheep (mixed merino breed), and to your surprise—for this is a Mohammedan country—125,000 head of hogs which must all be raised by the French colons.

You see too that the dwarf palm, which covers patches of the country everywhere, vies with the native spiny jujube as being the worst weed of the country and that ten to twenty thousand acres of these weeds are dug out each year by the French agriculturists. It is estimated that thirty per cent of the land in the Region d'Oujda, the easternmost subdivision of Morocco, is occupied by the wild jujube alone. This represents an area of 80,000 or so acres. At first I was inclined to think of this jujube (*Zizyphus lotus*) as an unmitigated nuisance, but as I learned more about it I came to respect it for its protective qualities. Morocco is a land of sheep and goats; it is also a land in which there are immense areas of communal lands over which every proprietor has the right to herd his flocks. As a result, during the dry season every blade of grass and every flowering plant runs the risk of being discovered by the browsing herds. The result of this grazing policy, carried on through the centuries, has been the extermination of every kind of plant that is not fortunate enough to be protected by the thorns of the wild jujube. In many places the only botanizing one can do is around these terribly thorny bushes. Were it not for this spiny weed the flora of the country would be quite a different one. Not only this, but the Arabs have come to make a use of it which compares very favorably with the use that a Western farmer makes of barbed wire fencing. Every group of farm huts, every straw stack, seems to depend on a windrow of the dead branches of this plant for complete protection from the goats, and even the avenue trees planted by the French are protected in this way. It really is a plant of very considerable economic value to this civilization.

Monsieur Ribrol guided us to what is considered the best orange-growing region in the Protectorate, that near Port Say. I must confess I never saw orange trees more heavily laden with oranges of a large and very attractive appearance than those we saw there. The flavor seemed to me lacking in character, however, and I have often wondered what price this fruit brings on the Paris market.

As we were admiring these showy oranges Graham espied a chamelion, an extraordinary little animal, not in the least like the so-called chamelions of Florida that dart about so quickly. This Moroccan chamelion was incredibly languid, and moved as do the animals in a slow motion picture, save when some insect approached within reach of its extensible tongue. We took it along as a pet, and for weeks "George" lived on top of the shades of the car, turning himself just the dull gray color of the upholstery. He finally crossed the Atlantic and joined the slow-moving sloths of Dr. Curt Richter's laboratory at Johns Hopkins.

From Oujda to Taza the highway starts out with a newly planted avenue of mulberries seven miles long. It winds back and forth across an undulating plain covered with a dwarf palm (*Chamærops humilis,* L.) reminding me somewhat of the scrub palmetto of Florida. This palm vegetation changes rather abruptly and is succeeded by a vast area covered with great rounded masses of wild fennel (*Fœniculum vulgare,* Mill). To one who has known it only as a cultivated plant in Europe the sight of thousands of acres dotted with fennel as far as the eye can see is an interesting experience and it has about the darkest most wonderful green color that a plant could possibly have. How long ago it must have been that the sweet variety of this wild plant was domesticated; probably before the Romans sent

The Moroccan chameleon has movements as slow as those of the sloth, but its tongue can dart out with surprising rapidity if you offer it a fly.

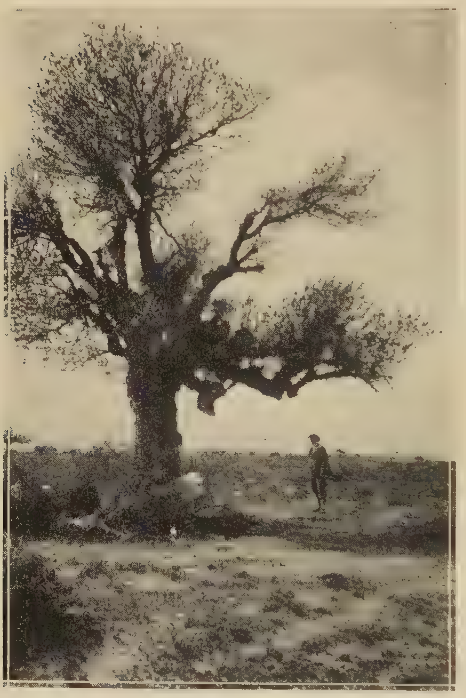
their legions through Morocco! To-day, outside of Italy and Greece, one sees little of the sweet fennel which takes, in those countries, the place that celery does with us.

The rainfall of the region through which one travels from Oujda to Taza is about fourteen inches annually, and the temperatures, moderated by the Mediterranean, range from 116 degrees in summer to 25 in winter. It resembles the coastal climate of California around Palo Alto, only the temperatures go higher in summer and not so low in winter.

It was now the last of March and cool at night. We were glad to be out in the warm sunshine and after lunch Mrs. Fairchild decided she would remain in the car and let Graham and me roam after plants and insects. We were just a bit nervous; it was our first all-day trip across the Moroccan plains and we had been repeatedly warned that we must get into Taza before dark, so I looked carefully over the landscape to see that there was nobody in view before I left her. I wandered nearly out of sight of the car in my search for the seeds of a species of burr clover I had gotten track of, and finding a cache of the seeds of the species I was looking for near an anthill I sat down to investigate. I suppose that I had been sitting there three minutes, not more, when I heard a sound, and looking up saw a tall, white-robed Arab standing over me. Naturally, he startled me. Where had he sprung from? He had not been in sight a moment before, I knew this for I had purposely taken a good look around. Was the region full of concealed Arabs? These ideas passed quickly through my mind as I looked at the curious face above me. However it would do no good to appear frightened, so raising one of the pods of the bur clover between my fingers I put it to my lips and gave the face above me the universal questioning look that means, "Is it good to eat?" As I expected, he shook his head and pointing to some sheep near-by indicated that it was eaten by them. What he said I could not understand, but any slight nervousness I had, had vanished, for

I perceived that he was simply a sheep herder who had perhaps been asleep near the place where I stopped, and when I stooped down had been curious to see what I was doing. I talked with him for a few minutes in signs, he smiled and we parted.

This incident, entirely trivial in character, serves to illustrate what we came to recognize as a peculiarity of the great plains of Morocco. The landscape could be as deserted and silent as the desert one moment and in the next you would see Arabs passing to and fro across the plain, and perhaps hear some goatherd calling to his friend across the valley. Unlike the great plains of our Southwest which are practically deserted, those of Morocco are inhabited. After all, there are four and a half million people in the country and a much larger proportion live on the land than in Texas. Their low huts, surrounded by masses of piled-up thorny jujube branches blend into the landscape at a little distance, though how the Arabs in their conscpicuous white robes managed to conceal themselves remained a mystery.



Often a giant betoom (*Pistacia atlantica*) would be the only tree in sight for miles. How did it ever get started?

My friend Swingle and I had been interested in the pistache nut for years. I sent in a case full of plants of the Grecian variety from Athens in 1901, while he made collections in Algeria and Syria. He found that the native betoom tree, *Pistacia atlantica,* the only tree of any size growing in the northern Sahara, was of much promise as a drouth and alkali resistant stock for the true pistache nut tree, and he had introduced it into California, Arizona, and Texas where trees of considerable size are now growing. He had often told me of the trees in the Sahara, so, although I had never seen the wild betoom, I was on the lookout for them, and when across the bare plain here and there single trees of good size loomed up, I guessed what they might be. Sometimes there would be a single large betoom tree and not another to be seen anywhere in the whole dry landscape. How this tree, marvelously adapted though it is to dry soils, ever gets started is a puzzle. I imagine, since the larger trees are a century or more old, that they depend upon the occurrence of two or more very unusual seasons, with rains coming just at the right time for the nuts to germinate, and continuing long enough for the young plants to strike their roots deeply enough into the soil not to be killed by the scorching sun when the next severe drouth occurs. Chance must also decree that the seeds fall in some brush of jujube or their chances of escaping the goats would be pretty slim.

Spring is a bad time to find seeds of anything, and my search along the roadsides yielded only small quantities of the dried pods of the commonest species of bur clover which everywhere throughout Morocco are to be found in the ditches by the road, in striking contrast to America where bur clovers are not native. I did, however, find three seeds of the spiny asparagus which Dr. Trabut has called the Chelif asparagus. It has a wonderfully delicate flavor and in his estimation is worthy of cultivation.

I presume there are few people who have visited as many gardens scattered over the world as I have, but the little one that the forester from the National School of Forestry at Nancy had started at Taza struck me as one of the most pathetic I had ever seen. It was a tiny collection of eucalypts, and arborvitæ and junipers and mulberry trees which had only been set out two years. In one corner was a small out-door stove of brick, and I asked M. Rougon what that was for. "For the guard to warm himself at on cold nights," was the reply. I learned, on further questioning that the year before my visit, two Europeans had been shot by Riffians in the adjoining old olive orchard, also that the forester was afraid to collect on the mountain slopes around the town, and that every night a native stood watch over the little garden of introduced plants. I could see from my conversation with the young man that he liked the shelter of his own home land better than the wilds of Morocco. Had I known that within a month Taza would be the center of attack by the Riffians I should have been more sympathetic. The thing that I want to emphasize however is that here, on the very frontier of the French protectorate of Morocco by order of the Maréchal Governor Lyautey, there had already been established a little plant introduction garden equipped with a comfortable house for the forester in charge and where trees were being planted to test their adaptability to the particular conditions of the region. The French believe in trees and they love to have gardens.

The drive from Taza to Fez is monotonous, but we spent a good deal of time in looking at the scanty vegetation to be found among the dwarf palms and jujubes, feeling that somehow, now that we were really in Morocco, there should be something new and valuable to collect, notwithstanding the fact that I knew the great majority of all the plant species of Morocco are found also in other of the Mediterranean countries.

CHAPTER X

HUMAN RABBIT-WARRENS AND PALACES OF FEZ

EVERY one had advised us to be sure to get to Fez before nightfall as otherwise we could easily get lost, and that nobody was supposed to be on the highways between the two cities after dark. Thanks, however, to the fact that we stopped just at sunset to help out a French truck driver who was stranded, night did effectually settle down on us before we saw the walls of Fez. As it turned out, nothing could have been more fortunate, for it forced us to thread the narrow white-walled streets of the city in the dark, with nothing but the lights from our car to show the way, and a small Arab boy on the running board to guide us.

First impressions are precious for they last longer than almost any others. Ours of Fez are as lasting as those vivid pictures which childhood forms from its first reading of the Arabian Nights Entertainments. Streets incredibly crooked and narrow, walls brilliant white under the searchlights of the car, robed figures flattening themselves into doorways or against the wall at the honk of the horn, overhanging shade trees and latticed windows, every fascinating detail was there. When at last we stopped in a tiny open space at the gate of the hotel, we found ourselves at an old Moorish palace that had been only slightly altered to make room for guests whose tastes in bathing were different from those of the Sultan who once lived here. We were in Fez at last. We were in one of the real centers of the great Mohammedan civilization. I had been in Bagdad twenty-five years before and knew something of what to expect, but did not realize what a whirlwind of ideas and comparisons Fez was to bring.

Anyone who tries to get at the reasons for things as they are in Fez has a study which will tax his powers of analysis to their limit. In the first place he must give up the idea that his own experience in the particular civilization to which he belongs gives him a yardstick of right and wrong with which to measure the abuses he sees around him. Is it a sin to have as many wives and concubines as he can support? The religion of these people declares it to be a sin to eat swine's flesh, but not to have many wives. Is there a real relation between goodness and prayer? These people pray with a fervor that makes a Methodist prayer meeting seem amateurish. Is the ritual of religion more important than the sanitation of the city? The city is full of mosques, and hordes of slippered men crowd in and out of them, walking in the filth of human sewage to do it. Are religious books necessary for a civilization? You will search in vain for a library or even a bookstall in Fez that has a single book of a scientific character in it. Are modern factories the curse of our own civilization? Here is a city of more than a hundred and twenty-five thousand in which, practically speaking, not a wheel is turning. Is the curse of civilization to be found in alcoholic beverages? Here is one where scarcely a drop is consumed by any man or woman in it, here is prohibition incorporated, not into the constitution, but into the religion. Does some one say that the doctrine of equal rights for women is pulling the American civilization to pieces? Here is a land where none but men vote. Does the exposure of the body that has become common on the American beaches and reaches above the knees of the modern girls constitute a menace to our civilization? Here is one where for a woman to be seen with unveiled face on the street is unheard of. Are the frequency of bank robberies and murders an index of a decaying civilization? Here is one where the banks transfer their balances in open boxes, carried by unguarded, unarmed servants, and where murders such as in New York thrill us by their cruelty and cold-bloodedness are of the rarest occurrence.

I spent days poking around in the "souks," those narrow streets

A street in Fez from which, on both sides, lead off the human rabbit-warrens of this ancient city.

lined with tiny shops, each street devoted to one kind of industry, and visited the human rabbit-warrens of underground life that make of this city one of the great spectacles of the world. Its subterranean waterways through which streams of water murmur day and night remind one of its mountain character. The water is too thoroughly infected with the amœba of dysentery to be trusted by Europeans, even for brushing the teeth, and yet it is drunk from the fountains which in every native house bubble up in the faience-tiled patios.

The amazing waste everywhere is not the waste of money, for there is not much wealth here. It is the waste of human lives devoted to doing things which our civilization has long since relegated to machines which do them *en gros.* I remember finding in one dark underground room a naked man busily stuffing chaff and straw into a mud furnace with a stick. Above, on a narrow ledge was the fellow who spelled him in the operation of feeding the furnace, which had to be kept running night and day, for it was the water heater with which the bathhouse above it was supplied with hot water.

In another, a small millstone was whirling. It was propelled by a water wheel which might have represented the invention of an Archimedes, three thousand years ago. A man was tending this little mill, which turned out enough meal to supply perhaps a hundred people a day with bread.

Across the narrow street there was a queue of boys, each with a board on his head carrying homemade loaves of dough from his house to the bakeshop, where the baker with his long spade of wood shoved them into a mud oven kept heated by constant supplies of burning chaff.

Everywhere we went we found little boys or girls standing patiently in the street holding on their stretched out hands skeins of yarn which they shifted rhythmically in time with the tailors who, at the other ends of the yarn were putting fancy stitches into the *jallabas* they were decorating.

The best book stall in Fez. If you could read and understand every word in every book on its shelves you would not be one whit the wiser from the modern scientific point of view, for mediæval philosophy, traditions, doctrines, superstitions and tales fill them from cover to cover.

The souk of carpenters interested me particularly, perhaps because, having learned the trade as a boy, I felt competent to criticize the tools and methods employed by the Arab carpenters. There was not a well-made tool nor anything but the very most primitive labor-saving contrivance to be seen. In the souk of cabinetmakers such a thing as a square corner or a plane surface or a straightedge was not to be found on any of the tables and boxes and cabinets in the whole busy place, yet they were made and inlaid after a fashion so curiously artistic that they would sell to American women in preference to the most carefully made tables turned out by machinery.

This quality of beauty, which one sees everywhere in Fez, is one of the hardest things to explain. Somehow most of us have come to associate beauty, at least in architecture, with neatness or straightness or balanced plan, yet here are buildings executed with no regard to any of the rules of geometry, which are yet immeasurably more pleasing than most of the accurately designed structures made to the T-square, triangle plans of the modern architect. Take a look down the narrow street of sun-baked brick and dried mud which winds like a cowpath through the souks. The sunlight is moderated by falling through a lattice of crooked poles laid across from house to house, on which are tied other just as crooked but lighter poles running lengthwise of the street. There is nothing to it that a twelve-year-old child could not have done. Look at the street corners. They are none of them plumb, none of them square, and not one of them is carefully made. They show as plainly that they have been made by some human hand as a child's mud pies show the work of its little palms and fingers. Enter one of the stunningly beautiful palaces, its patios filled with plants, running water splashing in its fountains and see its faience-covered walls, decorated ceiling beams and alabaster or plaster grills through which only the morning sun can shine. You are conscious of never having been in a more charming place; one in which a sense of proportion was more perfectly exhibited. Yet when you examine it carefully you find that the doorway at the end of the room is just off the center of the wall space, that the doorposts are not quite upright, that the designs on them have been put on by a kind of guesswork system in which, when the design did not come out quite evenly, the workman simply changed the design so that it would. You notice that the ceiling beams are not laid parallel, nor are their ends all on exactly the same level, and there is seemingly no order in the size or arrangement of the niches which constitute such a beautiful characteristic of Moorish architecture. Your eye begins to search for a straight line or a sharp corner and fails to find either. I felt an irresistible desire to bring into one of these palaces some of my carpenter friends of the Middle West, who for years have been putting up houses in which every beam is level, every line straight, every corner sharp, every door jam plumb, and every window put exactly "where it should be" in relation to the wall space it occupies. Of course they would find fault with every detail, yet to my way of thinking they have made scarcely a single beautiful building but have put up scores of the ugliest structures that ever disfigured a landscape, whereas these descendants of the Moors have, by following their childish technique, made some of the loveliest architectural structures the world has ever seen, such as the famous Giralda at Seville, which itself, because of the attempts of the Spanish to make it prettier, pales before the marvelous tower of the Koutubia in Marrakesh. Not only have the Moors made beautiful towers and minarets and tombs and palaces, but they have built walled towns of flat-roofed white houses along whose streets you can wander for days without seeing a single structure which grates on your sense of appropriateness and proportion.

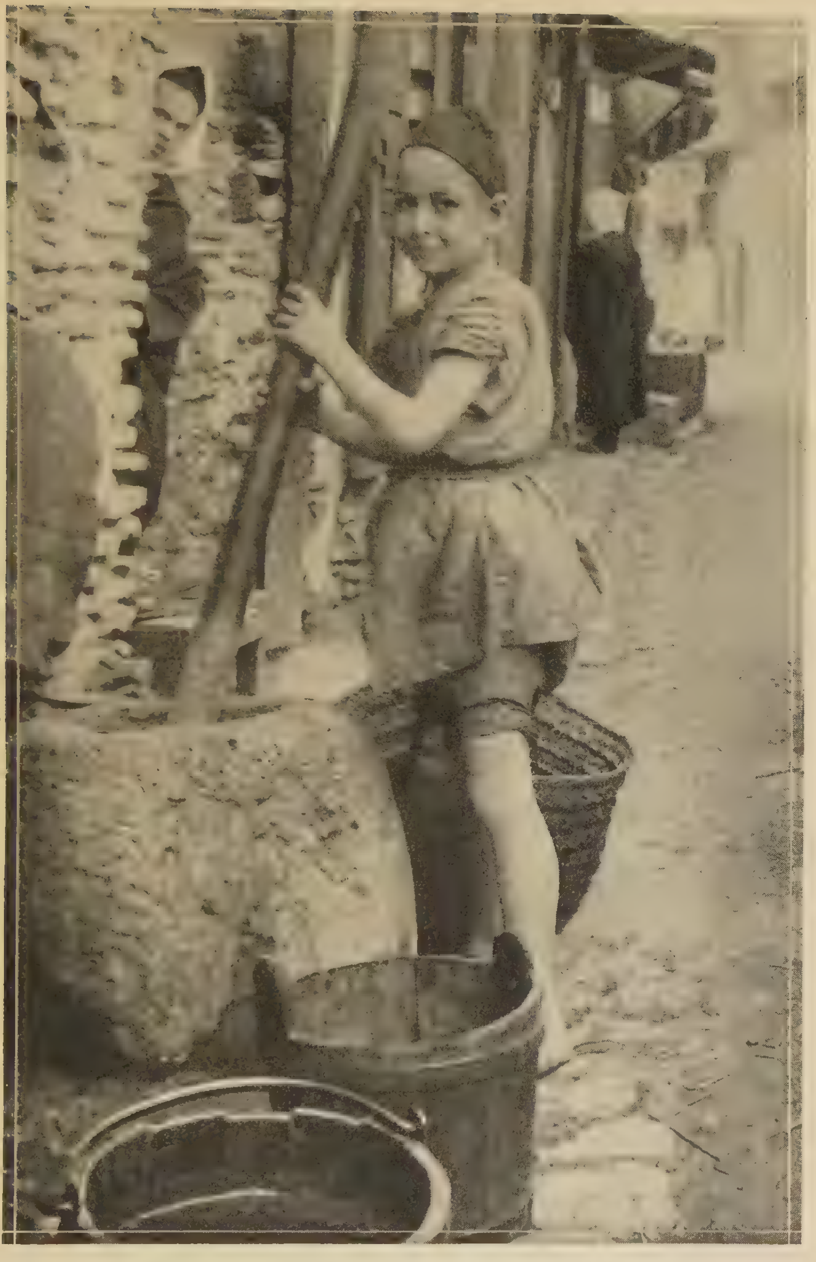
In the Annuaire Économique et Financier of the Protectorate of Morocco for 1924, are published the ground plans of the cities of the country. From these it becomes immediately obvious why the Arab quarters are so particularly attractive and the new

French cities, which thanks to Maréchal Lyautey, have not been allowed to encroach upon the old towns, are so indifferently commonplace. The streets in the Arab town seem to be as fortuitous as are the small veins on the leaf of a maple that you see when you hold it up to the light.

Curiously enough there is a similarity between the ground plans of the palaces of Morocco and those of ancient Crete as given by Glotz in his "Ægean Civilization." Perhaps it is the primitive nature of the architecture which makes it so pleasing. I was later impressed in the same way with the charm of the West African circular native huts with their thatched roofs which stand out in such striking contrast to the perfectly hideous corrugated-iron roofed shacks and ugly pretentious houses which the Europeans have built there.

One is bewildered in any attempt to measure this civilization which is almost completely illiterate yet which builds towns more charming than any of ours; which does not drink, which is essentially religious and which has stood so still that the only inventions one can discover anywhere in use are some of a trivial character that have come down from ancient times.

There are two ways of looking at the Moors. One can look at them as my friend Morton Wheeler does at his colonies of ants with their burrows and elaborate nests and still more elaborate habits and think of them as a whole, an "emergence," to speak in an evolutionary sense. Or one can think of them as people possessing greater potential possibilities than are apparent on the surface but held back by injurious habits of government, habits of property holding, habits of indolence, habits of mysticism and superstition, and habits of sensuousness. If one takes the latter viewpoint it would seem to stand out pretty clearly that the greatest sin of the race is an almost incredible licentiousness, the gratifying of which absorbs so much of the energy and imagination of the people from almost childhood to old age that there is little strength for intellectual activities. But here we run into



A boy pounding the shells of the pomegranate in the dyer's souk with as primitive a tool as that used by the savages of New Guinea.

the problem of which is cause and which is effect, and I prefer to take my friend Wheeler's point of view and think of them as an organism adapted to life in this southern latitude, a life which induces sleep in the bright middle of the day and has not anywhere seemed to encourage the development of the same kind of intellectual enjoyments as have the cool gray-sky regions of central and northern Europe. Climate plays a tremendous rôle in the intellectual life of mankind.

I visited one of the schools of Fez, for there are schools, of course. About thirty-five boys of varying shades were gathered in a small room with a middle-aged man as teacher, all sitting cross-legged on the floor. The boys were there to learn the Koran; learning being memorizing. I was reminded of the singsong rhyme of the alphabet I was taught as a child, only here in Fez the boys recite in concert at the top of their voices. In this way the precepts of the great Prophet are indelibly engraved on their brains. It is of course the principle used by our own parents to teach us the proverbs of the Bible, but imagine spending one's whole school life repeating over and over a thousand times such sayings as these, "Do unto others as ye would that they should do unto you," or "Early to bed and early to rise makes a man healthy, wealthy and wise," or "A gentle answer turneth away wrath." As the Koran concerns itself with the behavior of man down to the slightest detail of his daily life I have no doubt that the action patterns made in this way on the children's brains are responsible in a large measure for the comparatively small amount of petty criminality one hears about in the cities of Morocco. The French are gradually getting a hold on the schools, teaching in addition to the Koran, French and the three "Rs." There was such a school near our hotel in Rabat, and as I write these words I can still hear in my memory the voices of the Arab children as they drifted over to me once when I was ill. Although they were learning French the children were being taught in the Moorish manner, and I could pick out the words "Vingt-et-un," "Vingt deux," "Vingt trois" in an endless droning chorus. I should say that the noise of education was one of the national noises of Morocco, just as yodeling used to be one of the characteristic noises of the Alps.

I had come to Morocco however, not to criticize its civilization, but to see if during the many centuries of its existence there had not crept into it some cultivated plants which might be of interest to the farmers, fruit growers, or gardeners of America. I searched the souks and was bitterly disappointed at the quality of everything of a plant nature. The dates were very mediocre, the only new vegetable I saw was the "Gernina" (*Scolymus hispanica*), to which I have already alluded. The immense century-old grapevines that are grown over the pole awnings with which the souks are frequently shaded, interested me, and I had a great discussion with the owner of a stall in the souk where the largest of these grapevines grew. I tried to get him to aid me in cutting off some canes to grow, but he said it was a holy day of some sort and it would not do to cut it. He completely balked me in my attempts at that time, and the discouraging accounts of the quality of the fruit dissuaded me from trying again to get cuttings of it with which to clutter up the grape collections of California. In fact I began to realize the truth of Dr. Trabut's account of the decay into which the agriculture of Algiers had fallen before the advent of the French.

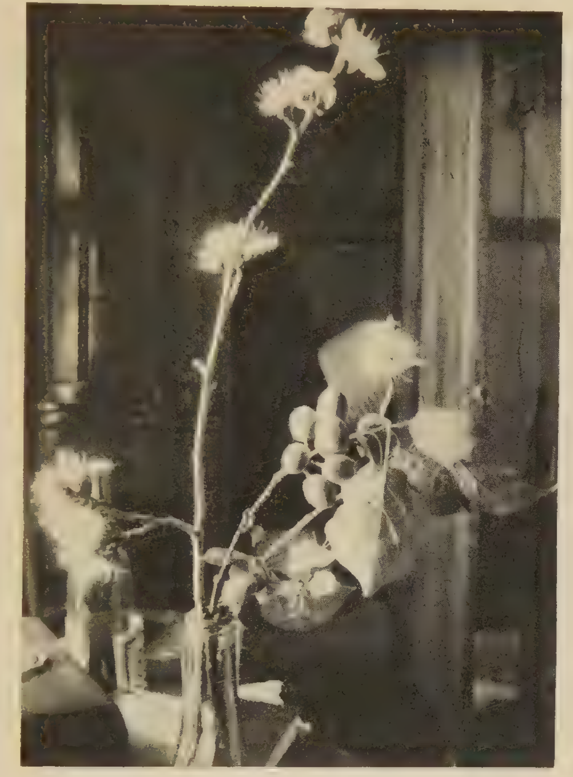
I turned from the souks to the palace grounds and parks of the suburbs of Fez.

We called on the Commanding General of the Region Militaire of Fez who was at the time the Count de Chambrun, well known to all Washingtonians. He and Madame de Chambrun, sister of the Honorable Nicholas Longworth, present Speaker of the House, hospitably entertained us at dinner in their superb palace-like home with a most beautifully proportioned salon in Moorish style. From the Count I was passed on to his Adjutant who put me in touch with a very sympathetic officer under whom came the parks and gardens of Fez, a Monsieur Albert Hubert, whose title was *Chef de Pepinière Municipale.*

I became attached to Hubert. He seemed to be thoroughly well trained and keenly interested, and although he felt the lonesomeness of being the only plantsman in Fez, he had organized and was running a creditable experimental Plant Introduction Garden.

If you wish to learn something about the climate of a region you must always consult the plants. They give you a positive index of the lowest temperature, whether the thermometer does or not. The limiting factor which bothered Hubert was an unusual drop to 21.5 degrees F. which had killed his poinsettias to the ground. The high summer temperatures of 115° F. enabled him to grow many things he could not in France where the summers are cool, but the drop in winter, lower than any experienced on the coast, prevented him from doing anything with strictly tropical plants. He had not been there long but already he had the Japanese persimmon, various bamboos, a collection of plums, and a great many of those commoner ornamental plants one sees in the parks around the Mediterranean. He took me to some of the old private gardens of the Sultan which have, since the occupation, been turned into public parks. Like all of the Arab gardens I saw in Morocco they showed a complete lack of any consistent policy or continuity of planting and their charm consisted mainly in their bizarre arrangement of plants, much as though a child had directed them. There were no vistas in the park; there were paths but without any reasonable design. The largest of the parks reminded me forcibly of Joe Cannon's ideals for the Mall in Washington expressed when he was opposing Roosevelt in the matter of the placing of the Agricultural Building. "Sow the thing down to blue grass and plant the buildings anywhere you damn please."

However, Monsieur Hubert had not taken me to the old park to see how badly it had been designed, but to show me some immense native apricot trees that stood there. One of them was thirty inches through and forty feet high. I do not know how old it was. Monsieur Hubert had carried on some suggestive tests with these apricots, which everywhere in the palace grounds were covered with young fruit. The species has such vigor and is evidently so well adapted to the conditions of Morocco, that he had budded ten varieties of imported French apricots on it and had these growing in his Municipal Gardens. One of these French apricots, the Luizet, which, according to the description in *Le Bon Jardinier,* flowers in France on April 4th, was in bloom in Fez April 3rd, but the trees of the Moroccan apricot were in full leaf by this time and were loaded with fruit almost half grown. This Moroccan apricot, grown everywhere from seed, is a tremendous bearer. Its fruits are small and although I did not have a chance to



The Moroccan apricot is much earlier than the French varieties. As shown in the photograph, a branch of the French apricot was in bloom on April 3d, whereas the Moroccan apricot (right) had half-grown fruits on it and was in full leaf.

taste them, I understand do not compare very favorably with the best grafted varieties. Even so, they are so much earlier that they may find a ready market wherever they are grown. It was as a possible long-lived stock that this Moroccan apricot appealed at once to my imagination. Its great vigor and productivity made it appear a valuable thing to introduce into America and I made arrangements with Monsieur Hubert to send a quantity of the seeds of it when they should be ripe. The Rif war came and I lost touch with him, but true to his promise he did send to Washington nine pounds of seed in January, 1927, and these have made a remarkable start in the Plant Introduction Garden at Chico, California. The next ten years will tell whether we have in this Moroccan apricot one which will add a valuable early fruiting variety or a superior stock to the apricot orchards of California and the other apricot regions of America.

The first trial of the Moroccan apricot in America. A row of plants grown from the seed that M. Hubert sent from Fez being budded with various varieties of fruit to test it as a stock in different parts of America. Photograph taken in the Plant Introduction Garden at Chico, California, in 1928.

During our stay in Fez we made a run to Sefrou, south toward the great Sahara, passing the troops as we went. It is a town into which come caravans from the great country of wilder tribesmen lying beyond the Middle Atlas. Three things remain in my memory of this picturesque but dirty place, the hundreds of children, who looked more Jewish than Arab, the primitive laundry place of the town, swarming with women trying to get a place in the sluggish stream in which to wash their clothes, and the Fondouk. Travelers in Morocco are always talking of their stay in a Fondouk or Fondak. Sir Joseph Hooker in his "Tour in Morocco" (p. 32)[1] gives a clear picture of his party's experiences in one or rather *on* one for he refused to sleep inside. A fondouk is a caravansary, a kind of hotel, in which the caravan-weary traveler stops when he arrives at the end of his long desert journey. I have frequented most of the filthy places to be found in the world, off and on during my travels, but the fondouk in Sefrou beats them all. I doubt if any American who has not traveled in the Orient could ever imagine anything so filthy as a place to stay in, unless it were to come to him in some nightmare. There was a courtyard filled with rotting manure of all descriptions, surrounded by rooms with no windows, but with doors leading off the courtyard. These dungeon-like places swarming with vermin were for the accommodation of the guests. As we looked this frightful place over, a half-witted, ragged, dirty beggar walked across its filth, babbling incoherently and stood leering at us. The scene has haunted me unreasonably. And I cannot disassociate Morocco from the fondouk of Sefrou.

It is when one compares scenes in this town of ten thousand people with scenes in an American town of the same size; the fondouk and the washing place on the stones of the dirty stream, with the clean hotel, and the steam laundry or electric washing machine which one finds almost everywhere in America, that one is aware what extremes of comfort and sanitation may separate two communities.

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[1] Hooker, Joseph Dalton, and Ball, John, "Journal of a Tour in Morocco, and the Great Atlas"; Macmillan, London, 1878, is a remarkable book by a most remarkable man.

One could spend weeks studying the souks of Fez and Sefrou just as one could the stalls in that incomparable Chinese city of Canton. At least I could, for it gives me a delightful uncertainty with regard to the correctness of all the theories about our civilization that I have read and listened to, theories born usually of an ignorance of any other than the one civilization the philosopher knows. You are conscious in Fez that the habits you see everywhere about you have been passed down from parents to children for such a long time that they are almost, like the germ plasm which passes from generation to generation, immortal. These Moors were doing about what they are doing now, when the giant Sequoias were tiny seedlings, long before there was a glimmering in the mind of the European that there was an American continent.

CHAPTER XI

FROM FEZ TO MEKNEZ AND RABAT

IF we had failed to recognize the antiquity of Fez with all that went with it, the afternoon we spent in the ruins of Volubilis, once a thriving Roman town built by Roman legions, would have settled it in our minds. Somehow it was hard to realize that a civilization so primitive as that of the Moors could antedate or be coincident with one like the Roman, which had reached so high a degree of development. The graceful Roman columns and massive dimensions of the ruins stood out in a curious symbolic contrast with the primitive dwellings of the sacred city of Moulay Idris on the mountain side a few miles away.

We had just time for a glimpse of Moulay Idris before pushing on to make Meknez that night, so, leaving QQ at its gate we toiled up to the square of this most holy of Moorish towns. It was Ramadan and we entered just as the fast of the day was closing. There was an air of expectancy on the faces of the people. Young Arab swells of the town stood with unlighted cigarettes in their fingers, children stood with bowls of steaming broth in their hands, in the street in front of the doors the evening meal was being prepared in readiness for the moment of sunset when the gun should be fired that would tell them they could satisfy hunger and thirst at last.

This is no place in which to discuss the institution of Ramadan, although it would be a mistake to think you can appreciate the Mohammedans without studying it. The striking character and permanence of religious taboos, of which this is one, are worthy of the study of Americans. The Mohammedan taboo against touching food or drinking water between sunrise and sunset during a period of thirty days in commemoration of the month in which the Koran was sent down from heaven, might well be compared with the sin of fishing on Sunday.

I used to think that the fast of Ramadan was a real fast, but in reality it is only a shifting of the meal hours, for once the gun has been fired the eating begins, and, according to the words of the Koran, may continue "until ye can plainly distinguish a white thread from a black thread."

So we sat on some stools offered to us and waited there in Moulay Idris and saw in this sacred city the breaking of the day's fast. No one disturbed us, though we afterwards approached quite near to the large mosque and read the sign affixed there by the French government forbidding any European to step beyond the limits of the sign and enter the mosque. This is one of the many instances showing how the French have refrained in every way from interfering with the religion of the people. During our stay in Morocco we saw no evidences whatever of religious fanaticism. It undoubtedly exists, but how it can fail to die out slowly with the spread of a knowledge of the outside world is hard to imagine.

We had decided to stop at Meknez and go up into that part of the Atlas where the famous Atlas cedars occur, near a place called Azrou, but we learned when we called on the Chef des Eaux et Forêts, Monsieur Vogeli, that Azrou was still buried in snow, although it was now the first week in April. We visited the well-equipped laboratory of forestry attached to M. Vogeli's residence and then saw with him the amazing but now ruined palace which that incredible tyrant and despot Moulai Ishmail built with the labor of his slaves, among them thousands of white Europeans captured by the Corsairs. I cannot resist the impression that in this brute of a Sultan modern psychiatrists would have found an insane mind which hit out right and left at anything its fancy lighted upon. With his absolute power of life and death over all his subjects Moulai Ishmail was able to build structures comparable with the follies of many rich but unbalanced American millionaires or with the crazy King Ludwig's palace in Bavaria. A ruined stable that had once housed 12,000 horses, built with a great vaulted ceiling made of mud bricks gives one an idea of the magnitude of his operations. An incredibly beautiful arch of faience, that rivals in proportions anything anywhere in the world, one of the loveliest pieces of architecture I have ever seen, also bears the name of this tyrant. I could not help wondering whether, as was the case with the great Taj Mahal, some Italian slave, some architectural genius, had been pressed into the service of the Sultan and that I was looking at the work of his master mind. Certainly I shall never think of that solitary superb faience arch, built in the 18th century, which it is worth a visit to Morocco to see, as the creation of the brain of Moulay Ishmail. As we gazed at this astonishing work of art, Monsieur Vogeli told us how the hatred of the Sultan was so great that when the news spread that he was dead, every slave at work on the walls and palace stopped what he was doing and left. One can see the stones to-day, just where the masons dropped them. He was dead and everybody rejoiced, and nobody cared if his palace were ever finished or not.

Rabat, which is a short run from Meknez, is the capital of Morocco, the center of the civil and scientific activity of the country. French Rabat is essentially a fonctionnaires town, with little business outside the activities of the men who are employed in the various offices and scientific establishments. The courtesies extended to me by the various men I met there will always be a pleasant memory, for through the kindness of Dr. Jacques Liouville, Director of the Institut Scientifique Chérifien, I was able to meet various talented French scientists. Monsieur Miège, Chef de Service d'Experimentation Agricole, was carrying on some very remarkable work in the selection of cotton, wheats, oats, and leguminous plants on a newly built Experiment Station of ten hectares near Rabat. I saw there a plot of my old friend berseem or Alexandrian clover (*Trifolium alexandrinum*) that for so many centuries formed the pastures of lower Egypt. I had tried to introduce it into cultivation in the United States, but failed, because in the regions where it might otherwise be a success the winter temperatures are too low. A selected hardier strain that Trabut showed me in Algeria has withstood a temperature of 21° F. in Rabat, given three cuttings without irrigation, and with irrigation six cuttings a year, provided the seed is planted in September. Perhaps this may succeed in Arizona or California. I thought Monsieur Miège had gathered together a most remarkable collection of species for his breeding work. There was the wild pea (*Pisum elatius*), and one wonders why its forms have never been used in the creation of new garden peas.[1] Monsieur Miège also had a wild clover (*Trifolium bracteatum*) which shows promise in cultivation where the crimson clover (*Trifolium incarnatum*) is doing poorly; also a collection of vetches; *Medicago gerardi*, said to be richer in protein than alfalfa; some native grasses and *Avena algeriensis* which withstands the rust much better than do the French varieties. But the most interesting plants in his collection were those of the native Sar-Sar cotton, which he discovered being cultivated by a tribe of that name near Ouezzan and which he thinks is a hybrid.

In the trials that have been made with the Sar-Sar it has shown an unusual degree of precocity, resistance to drouth, and length and strength of fiber. Curiously enough, side by side with this wild hybrid of his discovery, Miège was growing my friend Kearney's "Yuma" cotton, produced in Arizona through the selection and breeding of cotton which came from seeds from North Africa. It was a good example of how, through the exchange of seeds and plants between scientific men in different continents, there has come about the origination of new and priceless varieties. Political boundaries have counted for little in the exchange between civilized peoples of seeds and plants. When I expressed a wish that I might have some of the seeds of this new native Moroccan cotton to send to my friend Kearney, Monsieur Miège was only too glad to give me as many seeds as I desired. Whether it will prove of value in America, as it promises to be in North Africa, time alone can decide.

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[1] It is a curious fact that the home of the cultivated pea is unknown. The early Greeks and Romans grew it extensively, but they only ate it dried. The use of green peas as a vegetable is of much more recent date and appears to have spread from Holland. Even as late as the end of the 17th century they were a rarity in France and were scarcely to be had except by importing them from Holland.

Monsieur Paul Regnier, one of the Inspectors of Agriculture, showed us many courtesies. When he took me to visit the Jardin d'Essais of Rabat I had a very pleasant surprise, for, as soon as I was introduced, Monsieur Pochon, the Director, became most enthusiastic, saying he had been in correspondence with the Office of Foreign Plant Introduction in Washington and had a lot of plants that we had sent him. It was a new garden. There were some fine hedges of *Myoporum insulare* from Australia, and *Atriplex halimus* from the western coast of France, with *Acacia cyclops* used as a shelter tree to shut off the winds from the ocean. Hanging over an island in the water-lily pond was *Lopezia bicolor,* with exquisite pink flowers, while nearby was a wonderful border of the loveliest *Mesembrianthemum* I ever saw, but the name of which nobody could tell me.

A comparison of the difficulties the gardeners of a foreign country have with those one has in one's own garden is sometimes comforting, and when I saw two Arab gardeners on their knees pulling out our Florida pest, the nut grass (*Cyperus esculentus*) from between a lot of bitter orange seedlings and heard Monsieur Pochon declare that it was the worst weed he had to deal with, I was conscious of a feeling of satisfaction. Nearby were some Arab women picking snails off the nursery stock. There were thousands of these snails everywhere, and were M. Pochon obliged to pay American prices for their removal I don't know what he would do. There are areas in Morocco that are white with them, reminding me of the infestation I once saw in Califonia near La Jolla. The species is *Helix pisa.*

Ever since coming to Morocco I had wondered if the avocado could not be grown there. Here in the Jardin d'Essais were three trees, but they appeared decidedly abnormal and unhappy. A fine specimen of the Monterey pine (*Pinus insignis*) was flourishing in the garden, reminding me of the significant fact that this species, which has almost become extinct on the coast of California, has spread to New Zealand and South Africa and become there one of their most important timber trees. It is a striking example of the illusion that lies in the idea that the cultivated plants of any region should be limited to the species that by fortuitous good fortune happen to be there at this particular geologic epoch.

Naturally the question uppermost in the minds of the French foresters, when the Protectorate was established, was what would grow on the poor dry soils of Morocco, and at the forestry station I was shown trees of *Eucalyptus rostrata*, not yet four years old, and sixteen feet high that I was told were a good example of what these soils will do with only twenty to thirty inches of rainfall. Like all the other dry regions of the world possessed of a mild climate, I suppose Morocco is destined to be eucalyptized botanically. Personally I rather resent the idea of a universal eucalyptus covering of the mild-wintered area of the planet, though I know it is utterly useless to protest.

CHAPTER XII

OUEZZAN AND THE OUED KORIFLA WITH MAIRE

To my delight and surprise there appeared at the Institut Scientifique Chérifien one morning, Prof. René Maire. He had come to make a trip to two little known botanical regions of Morocco, the Oued Korifla and the mountains back of Ouezzan.

To one who has seen the vast storehouses of utterly unknown material in the great jungle world below the Tropic of Capricorn, botanizing anywhere in the temperate zone though fascinating is rather lacking in excitement; however I knew that the trip to the Socrat el Nemra near Boulhaut and the Oued Korifla would be immensely interesting because of the enthusiasm and wide range of knowledge of Prof. Maire who knew every species almost at sight.

During the excursion to the Oued Korifla I kept a lookout for medicagos. This genus comprises one of the most remarkable of all cultivated species, the alfalfa, the history of whose domestication and distribution over the surface of the world would drag with it a vast deal of the history of civilization, for it seems to have been cultivated by the most ancient peoples of Syria and Arabia. Its very name of medicago indicates that it came to the Greeks from the land of the Medes and Persians. To-day there are more millions of acres covered with this plant and more millions of heads of cattle grazing or fed on it than there are of any other forage plant in the world. These fields extend from the steppes of almost Arctic Russia around the world to the cultivated lands which were once the pampas of Patagonia. It has become the great irrigated and dry-land forage crop of the whole world, so to speak.

Not a single species of medicago is native to the Western

Hemisphere and as McKee points out in his excellent study of the medicagos,[1] prior to 1898 only five of them had become naturalized in the United States. And this notwithstanding the fact that aside from the alfalfa there is a group of medicagos called bur clovers with distinct possibilities as pasture plants and even as hay-producing crops, in the mild-wintered sections of America. This is a large group, consisting of at least thirty-seven species and eighty subspecies, all of which are wild around the Mediterranean basin. These are all annuals, whereas the alfalfa is, of course, a perennial, but nevertheless, by their remarkable seeding characteristics, they are able to maintain themselves even in the driest sun-scorched regions, overrun with goats which eat almost every living plant to the ground and even pull many of them out by the roots.

There is something fascinating about the bur clovers or medicagos. This one is a form of *Medicago orbicularis.*

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[1] McKee, Roland, "Nonperennial Medicagos." The Agronomic Value and Botanical Relationship of the Species. Bul. 267, Bureau of Plant Industry, 1913.

Ever since my first trip to Algeria, when I helped my friend Carl Scofield collect bur clovers, there has been a fascination for me in the genus.

I knew that between the years 1898 and 1912 the Office of Plant Introduction in Washington had brought in over sixty forms of these bur clovers and that my chances of getting new ones were not so good as they would have been in the nineties, but often some strain of a certain species turns out to have a valuable character of vigor or hardiness, so I determined to collect all the forms I saw, and trust to the mills of time to test them out in the vast territories of America. It is not alone the green plants of the bur clovers that are valuable, for the seeds in their dry seed pods are produced in great abundance and when the summer drouths occur they are left scattered on the ground where the sheep and goats can pick them up. These seeds are very nutritious indeed and the ranges in which large quantities of bur clover occur are much richer than those where they are absent.

In other words the medicagos deserve to be widely established wherever they will grow wild on the millions of acres of range lands of the Southern and Southwestern States. So we always looked for the burs of the bur clovers, hoping to find some form that Roland McKee had never yet tested.

Morocco is a land of bulbs and it was fascinating to travel through a country where there were wild gladioli, wild narcissi and wild iris, three plants that, in America, are so closely associated with the home garden. The Byzantine Gladiolus (*Gladiolus byzantinus*, Mill.) with its slender grass-like leaves and freesia-like flowers; the tall stately purple-flowered *Iris tingitanus* with flowers so dark that when viewed by electric light they appeared almost black; the closely related form *Iris fontanesi* with lighter colored blooms but quite as stately when it raises its tall crest above the grass, were all there. *Narcissus viridiflora* I could not see in flower, for it is an autumn bloomer, but Maire declared it to be a superb little thing with clear green flowers and a jonquil odor. We found it growing on the edge of a "Deya," or low place that fills with water during the spring rains and later dries out again.

As we passed through the forest of Zuer my attention was attracted by some beautiful shrubs scattered here and there belonging to the sumach family (*Rhus pentaphylla*, Desf.). They were covered with berries that were ripening into a beautiful red color. The beauty of the plants and their high resistance to drouth might make them very interesting dooryard shrubs in the Southwestern States, quite aside from the fact Prof. Maire informed me of, that its bark is an important source of tannin, large quantities of it being shipped out of Morocco every year.

But it will not be alone for these plants, whatever becomes of the seeds of them in America, that we will remember the Oued Korifla, and the deep ravine through which flows the river or oued; it will be for our picturesque escape from it. QQ climbed bravely up out of the ravine over a narrow winding road rising higher and higher above the stream, the curves so sharp that more than once I had to back in order to turn them, and worst of all, the road was thronged with traffic. It was the close of Ramadan, and the road was full of men with loaded mules and donkeys and of Arab horsemen in full regalia of gold-embroidered saddles going to the Fantasia in Rabat. At each turn of the road they scattered to the edge to let us pass and stood anxiously holding their animals by heads and tails until we had gone by, one poor fellow being obliged to rescue his mule after it had gone over the bank. It was a ticklish job and left a lasting impression on all of us, and I imagine on the memories of the Arab drivers and horsemen as well.

I was taken ill in Rabat, but thanks to the excellence of the physician there I soon recovered sufficiently to meet Prof. Maire and the Agricultural Inspector, Monsieur Durand, at Kenitra and go with them to the ancient and fascinating town of Ouezzan that lies on the very border of the Rif country. I could not help thinking of our timid Parisian friend as, alone, I left the hotel in Rabat long after dark and drove to Kenitra with as little thought of danger as I would have in driving to Baltimore from Washington. I verily believe I was in much less danger of being held up or otherwise molested.

Kenitra or Knitra, as it is sometimes spelled, lies on the Oued Sebou, the one really navigable stream in Morocco, carrying a mean of four hundred cubic meters of water a minute, and when at its height two thousand cubic meters. As we lunched on the bank overlooking the stream and I examined the alluvial soil that the turn in the stream had washed away I thought of days I had spent on the Rio Grande above Brownsville, though the Rio Grande is much larger. Frankly, since I had heard so much of the Oued Sebou and the fertility of the great alluvial region called the "Gharb," I was prepared for a much larger stream and was disappointed. There is not water enough in the Oued Sebou to develop any great extent of territory. As for the Oued Bou Regreg and the Oum-er-Rebia, and the Oued Sous, these are all of minor importance and in the dry summer season become very small streams indeed. The Sous as we saw it later in June when the snows were vanishing from the Atlas mountains, and what irrigation there is was in full swing, was little more than a chain of half-stagnant pools. The fact must never be lost sight of, if one wants to understand the agriculture of Morocco, that the highest rainfall is only thirty-two inches per annum and that even in the High Atlas mountains, covered with snow as they are in winter, it probably does not exceed this figure. The areas capable of irrigation will always be limited by the comparatively small amount of water available for irrigation purposes.

When Maire announced, as we were driving through to Ouezzan, that no European botanist had ever botanized in the region of the town we were about to visit, because of the danger from raids by the Riffians, I began to feel the mild thrill of excitement that comes from possible danger, but as there were no signs whatever of any activity I came to the conclusion that Morocco had become a quiet country like Algeria. I said as much to Colonel Defrère, the officer in command, one evening in the little hotel in Ouezzan, and he said something in French slang to Maire that I could not catch, but which I have often thought of since the outbreak of hostilities, for the Riffians swept through the town itself a few weeks after our visit and I imagine he had not felt so secure as I, in my ignorance, had done.

I found the visit to Ouezzan one of the most interesting experiences I had in Morocco. It is a beautiful little town among old orchards of olives, which though centuries old, seemed, many of them, to have been grafted near the ground. The houses were white and the plaza onto which my hotel room looked was the scene one evening of the local "Fantasia," which consists of a dozen or so horsemen in full regalia racing madly from one end of the plaza to the other, firing salvos from their old-fashioned rifles. The astonishment of the crowd attested to the unusual character of the occasion, though so far as excitement is concerned, the fantasia is a pretty tame affair measured by modern standards of thrills.

We called on the commanding officer who lived in a perfectly charming house built in a most unconventional style. The center was occupied by a large pool in which was an island completely covered with trailing pink pelargoniums. To one side of the pool was a large grape arbor made of rough poles and on the other side of the pool was the garden, of oranges, tangerines, almonds, apricots, the ever-present myrtle (*Myrtus communis* var. *Bœtica*), pomegranates, and beds gay with geraniums, sweet alyssum, snapdragons and *Chrysanthemum carinatum*, the Moroccan chrysanthemum. At one end of the pool was the dining room and at the other the living rooms. There was not a straight line anywhere to mar the charm of this strictly Moorish house.

As we strolled through the gardens and looked over the trees, I noted with surprise that the orange trees were absolutely free from any insect pests of any character, so far as I could discover. I concluded that their complete isolation, for I don't know how many years, in this walled garden, had kept them clean. I presume that with the opening up of Morocco and the travel through it of tourist automobiles and commercial trucks, all of the Mediterranean fruit pests will soon find their way into these gardens of Ouezzan, as they have already into other parts of the country. I could not help drawing a comparison with the Federal Horticultural Board's attempt to surround the United States with a Chinese wall of inspectors. It is all right until some one throws a diseased orange over the wall when the work of quarantine becomes a work of control.

Colonel Defrère gladly promised us two guards and gave us permission to botanize under the blockhouses on the mountain back of the town, so next morning we climbed through old olive orchards and along bubbling brooks up to the crest, where we could see off into the Rif territory. We did not find many plants with which Maire was not familiar, but he did collect on this hillside a variety of Silene which he paid me the compliment of naming Fairchildii in memory of the delightful occasion of our visit, and I suppose some day or other some herbarium scientist will wonder how in creation a plant in the Riffian mountains could bear the name of an American plant collector. I suppose one of the joys of finding entirely new forms is that associated with naming them after one's friends.

The only species that seemed to me of sufficient interest to gather for introduction was the rather rare *Narcissus elegans* of which we found a patch among the olives near the blockhouse and which Maire recognized as new, although it was not in bloom. My friend Ben Morrison flowered these bulbs in Washington later and sent me a beautiful photograph of one of the blossoms. The armed Arab guards went with us wherever we strolled, and at that time seemed to me the most useless appendages I had ever been bothered with. The blockhouses were surrounded by barbed-wire entanglements reminding me of the first time I had seen such things, which was in Kota Radja at the north end of Sumatra in 1896, where at the time the Dutch were fighting the Atchenese. What a horrible rôle the barbed wire has played in warfare since that time!

Although the expedition had not yielded much for introduction purposes it had given me a glimpse into the really old Morocco. I left Ouezzan with the feeling that I had been living among characters of the Bible where the sheep and the cattle are not merely domesticated animals but members of the household, for as we sat in a crowd in front of the café looking at the fantasia, a couple of cows, a bull and a calf quietly made their way through the crowd, pushing people to one side as though they had just as much right on the terrace among the tables as we had. It was related to me by a colon that when the French first took over the Protectorate one of the ideas of the agricultural experts was to grade up the cattle by the use of purebred bulls, but they discovered that the resulting bull calves were likely to be ugly and so they had to give up the idea, because the Arabs had been accustomed to handling only the thoroughly tamed and gentle bulls that wander freely through their villages. During my journeyings in Morocco I never had to give a thought to the temper of a bull as one must everywhere in America.

Returning from Ouezzan through the olive orchards and meadows where scores of white egrets were stalking about—a bird protected by Mussulman taboo, we stopped to collect seed of a newly discovered subspecies of the well-known genus Anchusa (*A. undulata* subspecies *lamprocarpa*) a striking flower that ought to be in every dooryard border, and near it the equally handsome *Malcolmea litorea* var. *goffardii,* an annual crucifer related to the Virginia stock, so-called. There is always a delight in seeing the plants one has known only in a cultivated state, growing wild, particularly when one is collecting the seeds and imagining what his friends will do with the plants that may grow from them.

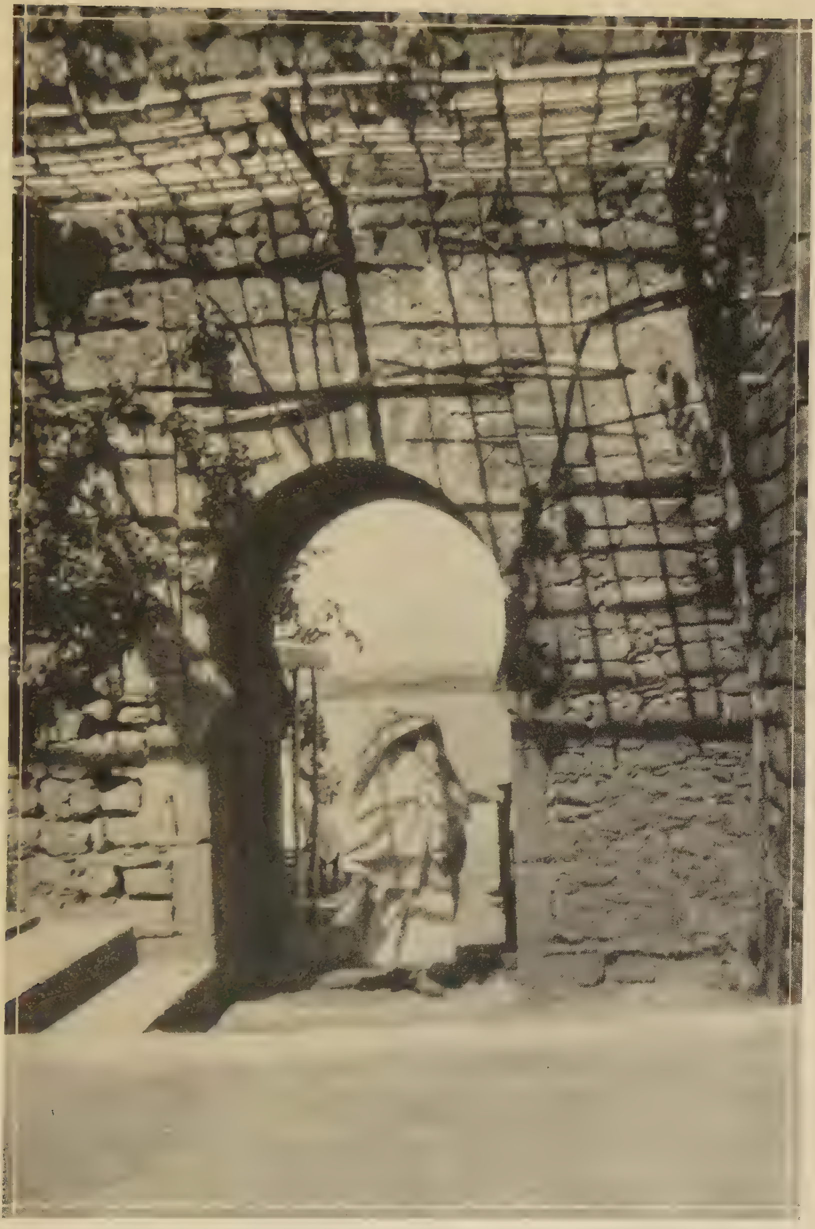
Prof. Maire had promised to show me a veritable wild botanic garden on the rich black soils of the Oued Fouart and as we approached it I could see, even at some distance, great masses of color. They were produced by huge plants of three species of wild Moroccan lavateras, a genus related to the mallows. In the rich gumbo soil of the Oued Fouart these three species, all with immense flowers of different hues of brilliant pink, produced in great profusion, grew superbly, some of them coming up to our shoulders. The plain was covered with hundreds of them, *Lavatera trimestris, L. punctata* var. *maroccana* and *L. malopetrifida.* Since there are species of lavatera growing wild in the islands off the California coast there should be an opportunity for some one to produce a host of varieties of these quick-growing, showy plants. Mixed with these gorgeous lavateras were wild mustards with golden yellow flowers, and the Moroccan sage, (*Salvia maroccana*), which furnished vivid blues.

Unfortunately one cannot see flowers and collect their seeds at the same time any more than one can eat one's cake and have it too. I regretted to have to leave to Monsieur Durand the task of collecting, if he were able to, the seeds of these superb things. What I regretted more than anything else was my inability to get seeds of the most beautiful yellow-flowered bush I have ever seen, *Calocotome intermedia,* a relative of the Cytissus and Genista but more floriferous and beautiful. It occurred near the roadside not far from Ouezzan. The adobe soil of this plain, that does not dry out as do the sandy soils, reminded me of the Texas adobe and there were growing all over it large numbers of medicagos, particularly *Medicago gerardii*, which attained the proportions of full-grown alfalfa plants.

CHAPTER XIII

THE GARDEN OF THE OUDAIAS, THE MARÉCHAL AND THE FOREST OF MAMORA

I THINK if some one were to ask me, "What did you like best in Morocco?", I should answer unhesitatingly "The Garden of the Oudaias in Rabat." I have seen beautiful gardens in England and Scotland and surrounding the Châteaux along the Loire, I know Versailles, and Pierre-fond and many others in France, Dutch and Belgian and Swedish gardens, the palace gardens of Bavaria and Austria, as well as lovely Miramar which Maximilian built on the Adriatic, and that other garden of royalty, the Kaiser's retreat on a mountain top in Corfu, and also his Potsdam gardens. I have wandered in many a charming villa garden of Italy and Sicily and seen the famous gardens of the Alhambra, Cintra and the lovely Monserrat near Lisbon; I know the remarkable gardens of Cape Town and those of Melbourne and Sydney and of Rio de Janeiro, and also the notable gardens of the New England States, the pretentious but altogether charming ones of Southern California, the incomparable Magnolia Garden near Charleston, and all of the large botanic gardens of the tropics including those of Peradeniya in Ceylon, and Buitenzorg Java, and the superb creations of Japanese and Chinese landscape art. I admit that no gardens are comparable, that each is in a sense the loveliest thing of its kind, but to me this garden in Rabat is the most remarkable of them all from the standpoint of its impression of complete simplicity and beauty of proportion. It is not a collection of plants and I am aware that many of my gardening friends would sniff at the meager show of species, for they could count off on their fingers many more growing in their own gardens. But I maintain that a garden is more than a col-



Leaving the garden of the Oudaias you go by this entrance into the little café overlooking the pirate city of Salé across the river.

lection of flowering plants, it is a work of art demanding the highest form of artistic skill. There must not be a single jarring note of color or grotesqueness of form, or error of proportion in the whole creation. The garden of the Oudaias, I found to be such a creation.

When I try to describe it I seem paralyzed, I simply cannot do it. I can see in my imagination its red-brown castellated walls on which the storks were nesting. I can hear their raucous calls. I see the blue morning-glories covering great spaces below the turrets where we used to walk. I hear the faint sound of the blindfolded donkey as it turned the water wheel near the Medersea and the trickling water falling into the lily tank near by. I see the long pergolas made of irregular poles and reeds on which the grapevines were casting flickering shadows on the paths beneath. I remember beds of blue and white verbenas below the level of the walks with here and there, regardless of any order, a pomegranate or apricot or orange tree, and the low-clipped hedge of lavender enclosing them. Beside the softly modeled broad steps that led from one level of the garden to another the broad-leaved Acanthus was in flower and yuccas were starting to send up their spikes of blooms. The large-flowered *Datura arborea* and some broad-leaved banana plants filled one corner of the great walled-in space. Through a superbly proportioned Moorish archway groups of white-robed Arabs were strolling, fans in hand, to the little café which overlooks the river Bou-reg-reg and the white-walled town of Salé on the other side, from which, in the years gone by, the Barbary Pirates sailed forth to capture and bring back the white slaves for their Seraglios.

We sat one afternoon in this little café and tried in vain to discover in what lay the incredible fascination of all around us. We were conscious that many a man of great wealth would give a fortune to have his own garden one-half so charming. How would it be possible to bring into anything he might build the element of the fortuitous which was everywhere about us? The terrace alone, built perhaps by slaves, was fitted against the cliff as securely as a swallow would tie its little nest to the rocks. The different levels and the winding paths from one to the other were built to fit the irregularities of the rocks. Every bench on which the Arabs sat and smoked showed the hand marks of the workmen. Not a straight line was anywhere to be found, not a corner that had been made sharp by the use of a trowel and straightedge. The arbor over our heads was made of canes with about as much idea of regularity as though some darky fresh from the cotton fields of the South had made it from the canes and poles growing by the stream. Everything which an American mason would do to make his work perfect had here not been done, but the one thing which in the great majority of cases an American cement worker would not pay attention to—the proportions of every detail, had been as scrupulously adhered to as are the proportions of a swallow's nest adhered to by the birds that build it. I sometimes think as I shudder before some frightful residence or some perfectly terrible bedding on a lawn, that we Americans are too self-conscious to do things simply.

While I was in Ouezzan with Maire, Mrs. Fairchild and Graham attended the functions of the Hedja and Fantasia at Rabat—the last in which Maréchal Lyautey took part. These festivities come at the close of Ramadan, when from all over Morocco the Kaids come with gifts which they present to the Sultan with great ceremony. It is a splendid show of Arab steeds and gold-embroidered Morocco leather saddles and trappings, and men with flowing snow-white robes and scarlet-bound headdresses. The Sultan, Mulay Yusef was also on horseback, protected from the sun by an immense gorgeous umbrella carried by one of his attendants. There was an impressive meeting on horseback between the Maréchal, who was Governor of the Protectorate, and the Sultan, a meeting supposed to emphasize the relation between the spiritual leadership of the people which remains in the person of the Sultan and the temporal leadership now vested in the

Governor General. This is probably one of the most interesting sights of its kind to be seen in the world, for with the spread of democracy the great ceremonials of the past have mostly vanished.

Being indebted to the Maréchal for a letter which had insured me the complete freedom of the country, I could not think of leaving Rabat without calling upon him. I went through the usual formalities of waiting in the hushed anteroom with others who wished to see him, and was finally ushered into the presence of a very erect but rather small, gray-haired soldier who won me at once by his pleasant direct manner. I did not know it at the time, but he had just returned from Fez with bad news about the Riffian front, and since I had nothing to ask of him he listened quietly, but I thought a bit impatiently, to my remarks regarding what I had observed, not asking any questions as I had surmised he might. He was quite deaf and I imagine only heard part of what I said, and I could not help wondering how one so old and handicapped by deafness could keep in touch with the multitudinous things going on around him. When I complimented him on the way he had succeeded in preventing new buildings being erected in the superbly beautiful old Arab towns of the country and said that in my opinion these would some day bring as much wealth into the country through the tourist trade as would its agriculture, his face brightened and he said, "You have no idea, Monsieur Fairchild, of the struggle I have had to prevent them from building commercial establishments inside these beautiful cities." Then I told him as I left that anyone should envy him the honor of having done two great things in Morocco, planting the highways with trees, and protecting the ancient cities from the ruin of modern architecture. He walked with me down the long corridor to the anteroom and I was conscious of being in the presence of a man of great force and charm but one who was getting rapidly old. The Riffian war came in a few weeks, and it was not long before he was retired to France, ending his career as a great administrator. I trust his policies with regard to avenues and the splendid Moorish cities will be continued, so that generations of Europeans and Americans can see how beautifully they built houses and towers before the days of the T-square and rule.

Have you not heard of the Forest of Mamora? Somewhere into the back of my mind the word had crept years ago. It is one of the largest cork oak forests of the world, containing over 300,000 acres and is an amazing place for bulbous plants. The trees are all of small size and do not produce the quality of cork that do the hillside forests of Spain, Corsica and Sardinia. In fact until 1919 they had never been subjected to the process of "mascalage" by which the good cork or so-called female cork is secured, but they represent a valuable commercial asset as long as no substitute for cork has been found. Before leaving Rabat I went with Mrs. Fairchild and Graham into this great cork forest carrying my "piosche" with me. The soil was a light sandy one in which, through the accumulation of ages, there had collected an amazing amount of humus. It was so light that I found I could drive a slender grass halm down into it eight or ten inches with the greatest ease. It was full of the bulbs of all kinds of liliaceous plants. I could hardly find a place where if I drove my "piosche" into it I did not bring up one or more of these bulbs. I thought of the refractory soils in which my friend David Griffiths was obliged to grow his bulbs in Washington State and wished he could transport his bulb growing to such a spot as that of the Forest of Mamora. The blooming season for most of these bulbs was past, unfortunately, although the charming little *Dipcadi serotina* was in bloom, and we were able to send bulbs of it, together with some of the Byzantine gladiolus, the attractive *Scilla peruviana* and *Leucoium trichophyllum* with graceful hanging white flowers, and the last named has already bloomed in Miss Kate Session's garden in San Diego, California. I cannot find that the romuleas are grown in California, but where light humus-rich sandy soils are to be had and the summers are dry *Romulea* *engleri*, Biquinet, which Maire declares is the prettiest of them, should be grown. Scattered among the cork oaks we saw full-grown trees of a native wild pear (*Pyrus longipes*), its masses of blooms a lovely sight against the evergreen foliage of the oaks. I was curious to see if they had the fungus that causes pear scab (*Fusicladium pyrinum*) which in the early nineties I had been sent into Western New York to fight with Bordeaux mixture, the first fungicide ever invented. Sure enough there it was, the little fungus, forming scabs on the calyx just as it did in the pear and apple orchards of New York. It has been here very likely for a thousand years, perhaps more, and it probably has spotted the pears of Europe ever since they were first grown there. Yet the opportunity was left to me, an American boy just out of his teens, to carry out one of the very first spraying experiments to control it, curiously enough in an orchard belonging to a Vice-President of the United States. Several weeks later when we drove with my friend Morton Wheeler through this same forest we noted great areas being completely defoliated by the gypsy moth (*Porthetria dispar*). We were considerably worried lest this pest should overrun the whole forest and destroy it, and afterwards when I visited Naples I expressed this fear to the entomologist there, who has had charge of the collecting of parasites sent to America to control the pest, but he scouted the idea, saying he believed the parasite was already in Morocco and would keep the gipsy moth in control.

CHAPTER XIV

CASABLANCA AND MARRAKESH

If we had had any doubts with regard to the effect of modern French architecture on the landscapes of Morocco, they vanished when we saw the new commercial town of Casablanca which has had its land boom and period of depression just like those with which American towns are familiar, only on a smaller scale. It is no doubt the most comfortable town and the liveliest one in Morocco, having every modern convenience, but one would not call it beautiful. It is modern French and is the gateway to the marvelous towns of the interior that are reached by bus lines centering in Casa.

The French have established experimental farms in connection with the chief towns of the Protectorate much like our own experiment stations in America. They are small and poorly supported affairs but have intelligent practical men in charge who are doing a fair amount of testing of fertilizers, rotations, varieties, and methods of planting. Until a considerable amount of information about these things has been accumulated in Morocco, no radical changes can be made in this ancient agriculture, which, through the centuries, has adapted itself to the climate, soil, and habits of its primitive peoples. I include habits in this category for there would be no practical use in trying to introduce swine culture on a large scale into Morocco, even though, as I learn, it is profitable among the colonists. The Mussulmen would not raise hogs, let alone eat them. But why they should not eat rye is another question. Rye is not taboo in the Koran. I saw at the experiment station near Fez a field of rye that seemed to demonstrate that this grain can be grown splendidly in Morocco.

"What's the use, the Arab won't eat it," was the laconic reply to my query as to why it was not cultivated. At the experiment station near Casa Blanca they were growing cotton, but I learned that the difficulties of raising cotton without irrigation arise from the late frosts of spring and the early ones of autumn, and the unsuitable distribution of the rains, which fall in winter instead of in summer, thus limiting the possible cotton cultivation to irrigated areas in the valley of the Sebou, of which 20,000 hectares or forty-four thousand acres represent the maximum possible, and even this would require *"un ensemble de travaux hydraulique de longue haliene."*

A little boy in chains, probably a common sight in the days gone by.

If we had failed so far to get a clear idea of the size of Morocco we got it when we started south toward the Great Atlas mountains to Marrakesh. We began to realize that it is nearly as large as France and almost as large as Algeria and four times the size of Tunis. It has eighteen hundred miles of highways and about the same stretch of secondary roads. It has a range of mountains running from end to end, with peaks in it over twelve thousand feet high, beyond which lie the great sand dunes of the Sahara. It has a coast line along the Atlantic as long as that of Florida from Jacksonville to Key West, and it lies due East from Savannah, Georgia.

The road seemed long to Marrakesh. There were stretches of perfectly straight highway forty kilometres long. The country on either side was *désértique* to say the least. It was not hot, though it was the middle of May, but the sun was bright, and there was an uncomfortable glare from the desert, a light that contracts the pupil of your eye to its limit. One single little town lies between Casa and Marrakesh and there we stopped for lunch. As we left, a wistful-looking child stood watching us. I was shocked to see shackles on his legs. What had he done? Was he some one's slave? Was he a criminal? I never found out, but his photograph stares at me from my album. It started me thinking of the sufferings from the cruelties of others that must have characterized the life in Morocco for centuries and the lessening of it that the advent of the French has brought.

Once you are out of sight of the old towns with their turreted walls you might imagine you were anywhere in our great Southwest and as we rode on, mile after mile, we seemed, in our imagination, to be back on the Great Plains, when suddenly, as though some Genii had set it there before us, we found we were rapidly approaching the arched gateway of a great walled city whose ramparts stretched away on either side of us for half a mile. A camel, frightened by our approach, screamed and struggled with his driver as it came out of the archway. In a moment we passed through the narrow gate barely wide enough to let us in and found ourselves back in Bible times and scenes two thousand years ago. The contrast was complete. It is one of the great thrills of the land to seem to be quietly motoring at home and then suddenly see the turrets of an ancient city loom before you and in a few seconds be surrounded by the hoary past.

The snow on the Great Atlas had almost disappeared. The flowers on the plains had mostly dried up, it was beginning to get warm and the winter tourists had gone. The nights were comfortable and at 7:30 A.M. the thermometer stood at 62° F., May 17th and it was overcast. The winter temperatures in Marrakesh go lower than I had suspected—to plus 22° F. and frosts occur as late as the 25th of March, making any cultivation of tropical trees out of the question. I had supposed that the skies would be brilliantly clear throughout the winter but the weather records show them to be quite often overcast. In December there were only fourteen cloudless days; in January fourteen; in February eleven, and in March only two, making for the winter months only one-third of the time during which the sky was clear. From these figures it is evident that although Marrakesh is one hundred miles from the Atlantic it is not beyond the reach of the influence of the Canary Island cold current that sweeps southward along the coast, just as the California cold current sweeps down the coast of California. The soil temperatures are low also, according to Monsieur Tornezy the Inspector of Agriculture of Marrakesh and one of the best students of the agriculture of the region. At five feet below the surface it was only 46° F. in midwinter and in the middle of May 62° F.

The large fashionable hotel was closed and we lived in the smaller one right in the middle of the town, walled in from a noisy souk, and although the rooms and other equipment of the hotel were excellent, the occasional outbreaks of plague in the town made us wish that we were farther out.

Marrakesh is in the center of an ancient irrigated region, the land sloping down to it from the Great Atlas. There is an underground system of canals called "retharas," by which the water from the Atlas is distributed over a considerable area. These canals are among the most curious and ingenious of all the hydraulic inventions of ancient times. They are known in Persia and Java as well as here, and doubtless there is somewhere an exhaustive memoir upon their history, but I have not got it in my library. One's attention is first attracted to these canals by finding on the plains what looks like a shallow well with no sign of a

The date plantations of Marrakesh are composed of seedling trees.

well curb and with running water flowing through it. Across the plain, fifty yards nearer the Atlas, is another well just like it. In fact you soon see that there is a string of these wells stretching away to the horizon, as you can tell by the ranker grasses that grow around their mouths. Monsieur Tornezy explained to me that these wells are all connected by underground canals dug by hand, which, if you follow them, take you back into the foothills of the Atlas, and that back there the wells are sometimes a hundred feet deep. The depth gradually decreases as the canal gets farther away from the foothills until it actually runs on the surface of the ground. The whole thing is a device to collect the underground waters abundant near the foothills and conduct them by means of these carefully leveled tunnels as far as possible into the valley. The canals are spread out like the fingers of your hand to catch any subterranean streams lying above their levels and conduct them into immense basins or irrigation tanks on the outskirts of Marrakesh.

One must wonder whose was the brain which devised this system and first put it into operation. It is a pity that his name has been forgotten, for considering the comforts it has brought to the dwellers in this walled city, it should rank as a really great invention. The skill and expense required to maintain these retharas will sooner or later force the adoption of modern pumps and presumably the development of artesian wells.

I was informed that the "Palmiera," as the groves of date palms around the city are called, were the most extensive in the world and that there were more than a million trees in them, but from what I have seen of the date palm plantations of Arabia and Egypt I am inclined to think this is an overestimate, although one may easily be mistaken. The Oasis of the Fayoum in Egypt, with only half a million seemed as large, in my memory. The palms are almost all grown from seed, as in some of the plantations along the Nile, but why the level of its culture should never have been raised is difficult to explain. With the large city of

145,000 inhabitants, one would have thought that the demand for the best date would have brought with it the desire to propagate from the best palms by means of the ancient practice of cutting and planting the offshoots, for the seeds of course do not come true.

My friend Mason [1] found that it was quite common in Egypt for the owner of a superior date palm to prefer the distinction of having the only palm of its kind, rather than the more democratic pleasure of seeing plantations of it giving better dates to many. Since the date palm, although it lives and bears for a century or more, only produces suckers in its youth, neglect to cut its suckers at that time puts the owner in undisputed possession of a unique thing of which he can boast. No way was known to them by which one of these rare palms could be reproduced, once its suckering days had passed. Whether or not this is the reason why there are no good varieties grown from suckers in Marrakesh, I do not know. Perhaps the climate of this town near the Atlantic is too cool for the best dates. The fact remains that I could not get track of a single worth-while variety and found that every intelligent person there extols the Algerian and Tunisian varieties but condemns those of Marrakesh. I never found a good date in the souks. I was forcibly reminded of the seedling date plantations which were doubtless started by the Moors in Southeastern Spain near Elche, which I once studied in 1901. If one were to stay in Marrakesh throughout a date season I have no doubt he could pick up some good seedlings, though it seems strange that the fame of none of these has filtered out among the French who are there. It was a great disappointment to me, as I had hoped to add at least one new variety to the collections of date palms we have gathered together in California.

How simple and rural this Moorish civilization is, becomes evident when one considers the elements of which it is composed.

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[1] Mason, S. C., "Date Culture in Egypt and The Sudan." Bull. No. 1457, U. S. Dep't of Agriculture, May, 1927, p. 8.

The mosque and the mederseas, or halls of learning, are very bare and simple buildings with no furniture at all. The only bookstore I was able to discover is one without a single modern book in it, the Koran and the Arabian Nights and philosophical works composing its entire contents. The souks are shopping places for household things such as rugs, clothing, dishes, little household conveniences of the simplest kind, furniture and foods. In the great open square one sees here and there a story teller surrounded by a little group of figures sitting quietly cross-legged to hear his tales, or a snake charmer, or a conjurer, each with his admiring circle, near-by one sees a man with a few dozen onions on the ground before him; a roast mutton dealer with a tripod and scales in which to weigh great hunks of mutton; a dirty candy seller with balls of sesame seed stuck together with molasses, a date dealer with steelyard for weighing his wares, or perhaps a doughnut maker frying crude balls of dough in a caldron of olive oil.

There were beautiful Arab horses being raced across the marketplace to show their speed to prospective buyers, but no such show of livestock as one would see in an Iowa county fair.

I felt when I stood in the camel market that I was among a lot of hairy, long-legged turtles belonging to some previous period of the world's history, the carriage of a camel's head is so like that of a Galapagos turtle. He has an inconceivably haughty and sophisticated look about him. Mrs. Fairchild had a miniature donkey that scarcely reached to her knees offered to her for the sum of twenty-five cents and she could hardly resist the temptation of putting it on the running board and taking it back to Switzerland to Nancy Bell. In the markets one seldom sees fowl of any kind, never pork of course, rarely beef, but always mutton and goat's flesh. Although the Moors are essentially mutton and goat eaters they have never, according to French agriculturists, developed any particularly good races of these animals, have not learned the importance of stored forage, such as hay and grains and silage, and have never developed any system of watering places for their stock. The broken up bits of dry straw called "teben," left after the grain has been threshed, constitutes practically the only reserve forage supply they are acquainted with.

But the Great Atlas was calling us, and fascinating as was the marvelous palace of the Bahia, the remarkable Arab gardens of the previous sultan, the souks where Mrs. Fairchild found fascinating Oriental jewelry, the curiously half-neglected olive groves, and the extensive date gardens about the town, the natural vegetation of the hills was more so. Furthermore we wanted to see what was on the other side of the snow-capped mountains and there was a perfectly good road through them, winding and steep and narrow, with precipices to pass, but a good road just the same. At a more peaceful time we could have continued on to the valley of the Sous and thence to Agadir, but with trouble in the North the government was taking no chances and foreigners were not allowed on the lonely mountain-sides.

There was another reason why we wanted quickly to take a look at the other side of the Atlas. My old friend Morton Wheeler of the Bussey Institution had been at the Sorbonne, lecturing on ants, and from his letters I judged he was tired of the gray skies of Paris and needed a change as badly as we needed his company in Morocco. We had wired him to join us and when we reached Marrakesh we had word that he would take the next boat for Casa, so Graham and I wanted to find out how the collecting would be back in the Atlas. Monsieur Descheseaux, the Chef du Département des Eaux et Forêts, a charming, enthusiastic forester had invited us to go with him to one of the forest outposts twenty-five kilometres back on the mountains, where there were guest rooms in which we could spend a week if we desired. It was a delightful trip, for the Atlas in late May is not yet hot enough to be uncomfortable (less than 80° at midday). Then there was a plant of the rare *Hedysarum membranaceum* on the Oued N'fis, which seemed to be a favorite of the stock there and perhaps seed of it could be obtained. Straight away through

Tahanaout we motored, passing hillsides covered with alfa grass and on into the region of the Phœnician juniper (*Juniperus phœnicea*), and then into what Maire calls the "subalpine region" where the incense cedar grows, *Juniperus thurifera*, L.

The scene that opens before one after crossing into the valley of the Oued Ait Ali is very beautiful, bare of vegetation at this time of year, but filled with a kind of mysterious interest from its proximity to the untamed country of the Sous. Below us, as we passed, was the sacred town of Moulai Brahmin to which the Arab women wishing babies make their pilgrimages. On the distant hills we caught our first sight of a Kasba, the fortress of some local chieftain, its high walls of sun-baked bricks a most picturesque and impressive sight after the low huts we had been passing all day. Monsieur Tornezy showed us photographs of the great Kasbas on the Southern slope of the Atlas and we very much regretted that we were not permitted to visit them.

We were stopped by a mountain stream at Asni through which our QQ could not pass, but through which we splashed in Monsieur Descheseaux's Ford. Beyond this N'fis river the road narrowed to a trail and for 25 kilometres we wound in and out through the desert vegetation, stopping to collect what interested us until we arrived at Tajadirt N' Bour at 3500 feet altitude, where, growing in the gravel beside the mountain stream we saw the *Hedysarum membranaceum* we had come to get the seeds of. Alas! we were too early, the shrub was not even in flower. Furthermore, the stock had been at it, and if their fondness for it has continued to this day, I fear they have exterminated it. The species seems to be a rare one, and we ought to have it for trial, but as yet I have not been able to get any seeds. It is not always easy to collect the seeds of wild plants.

We climbed the mountain side to the forester's house and were served a delicious luncheon by Madame Vial, here in the heart of the Atlas. The view was superb, below us were the ruins of adobe towns destroyed by the raids and counter raids that for centuries have surged back and forth through this pass. We overlooked the great caravan route to the Sous valley and I longed to keep right on down into that forbidden land, and on and on to the land of the veiled men [1] who veil their faces below the eyes to conceal themselves from evil spirits.

With the outbreak among the Riffians there was talk of spies and agitators among the people to the South and this forester's house on one of the principal passes into the Sous, stands out against the landscape, an excellent target for attack, yet with no more fear than the early pioneers showed for the Indians, Monsieur Vial and his young wife live here quite alone, surrounded by hundreds of Mohammedans. They seemed supremely happy planting their little nurseries which may some day cover the slopes of the Atlas with trees that will yield something worth waiting for.

Graham and I searched all the afternoon, he for insects and I for plants, but in vain. The dry season had come and everything was shriveled and brown. Even under the stones one found amazingly few insects of any character. It was no use, we should be wasting our time to come for a week, so, reluctantly enough we abandoned the plan and started homeward, only to find that the stream we had forded had risen with the increased melting of the snows, making the crossing very difficult.

Wheeler arrived on a French boat crowded with troops. I took the bus up to Casa to meet him and the next day we collected around the town and then took the bus back to Marrakesh. What a delight it was to have Wheeler, even though I felt afraid that I had misrepresented the character of the insect fauna when I wrote him to come, but Morocco had much more than ants to offer him, it had a society, a "collectivity" as he might call it, which kept his wondering brain busy, and I have no doubt contributed to his later writings a touch that they could not otherwise have had.

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[1] These are the descendants of the ancient Almoravides, who in the XIth Century came up from the borders of Senegal and conquered Morocco and later invaded Andalusia.

Then too, a cable from Allison Armour saying the Utowana was sailing for Casablanca and suggesting the plan of a preliminary cruise in the Canary Islands, outlined for us a very attractive summer program.

The days in and around Marrakesh with Wheeler were never-to-be-forgotten ones. Morning after morning we would start off with our lunch basket and spend the whole day on the vast plains in that wonderful, bracing air. Lunch was always an amusing event because some one was sure to come to look at us. The natives of this region are mostly Berbers, quite a different race from the Arabs, and it was a relief to be able to see the faces of the women, for the muffled white dummies of the cities gave one a feeling of dreariness and oppression. They were always interested in Mrs. Fairchild, particularly in what she wore, sometimes going to rather embarrassing lengths to satisfy their curiosity. One of our favorite pastimes was to hand one of these Berbers a piece of ice and watch her face when the "stone" turned to water.

The evening lights were wonderful on the foothills and one evening we tarried too long, so that when we arrived, some time after dark, at the walled city of Marrakesh we found the great wooden gate closed and barred. It was a strange feeling, that of being locked out of the town. We tooted our horn and rapped on the gate until a sleepy looking Arab came and for a backshish opened the gate and let us pass in. It is not regular however, and nobody takes any responsibility for what happens outside the walls at night.

One market day we went up to Amizmiz, about forty miles in the mountains. Caravans had come over the pass with herds of sheep and goats to be slaughtered for the feasts that take place at these markets. I have visited the packing houses in Chicago, and I have seen all sorts of animals slaughtered, but for downright goriness and unpleasantness I think Amizmiz "takes the cake."

Harvesters in the Great Atlas where one man's labor counts for about a fortieth of what it does in the grain fields of our great plains.

Imagine a barren hillside on which were a lot of dead trees standing, carcasses strung up to them were being skinned and cut into big hunks of irregular-shaped flesh, entrails everywhere, vendors with their piles of dripping wares on rough boards. I saw no evidence of any regular system of butchering, if they have one it escaped my observation. Men in their white woolen jellabas were wandering aimlessly about, while mangy-looking curs slunk around to be on hand whenever a sheep's or goat's throat was cut, in order to lap its blood.

Though hundreds of these men came from the "Zone d'Insecurité" as the French call the region of the Sous, we walked around among them and they paid little attention to us, were even curious to see the inside of my camera when I reloaded it. I have found that I can very quickly allay any superstition with regard to a camera by taking it to pieces in the presence of a crowd of unsympathetic natives, showing them everything inside of it, and even allowing them to look through the finder.

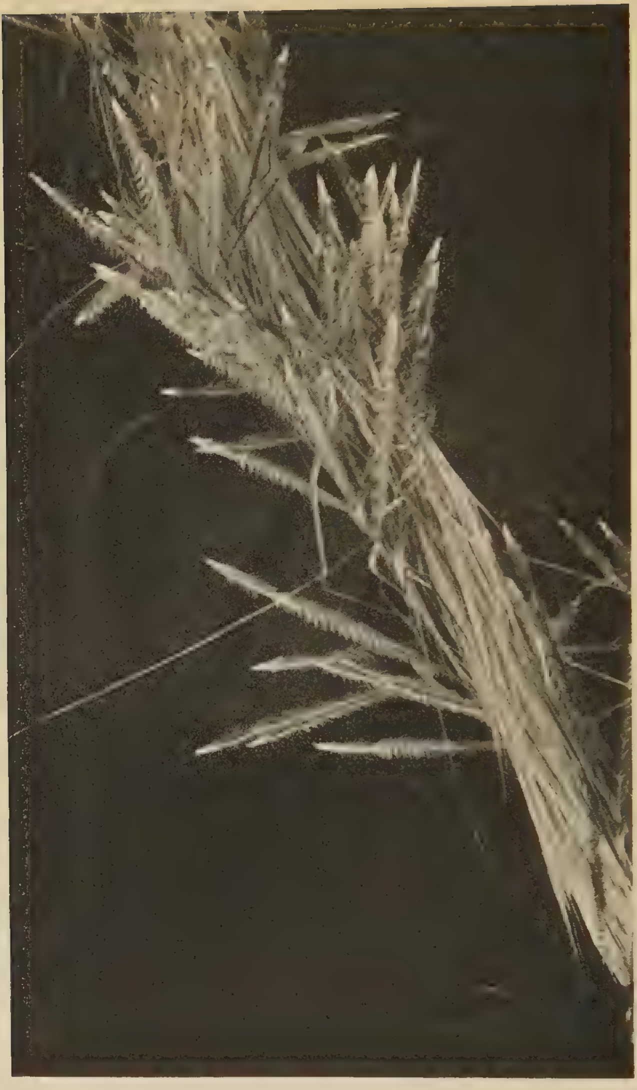
The most interesting device I saw at the market at Amizmiz was the oven in the ground for baking meat. It is really worthy of imitation by a barbecue technician if there are any such in America. It consisted of a deep hole in the clay soil the size of a small cistern with around it three smaller holes large enough to hold several carcasses, connected with the central one by underground flues. The dressed carcasses were hung in the three smaller cisterns, or more properly speaking, ovens, while a roaring fire of straw and chaff was kept burning in the central furnace. The heat entered the ovens through the flues and baked the meat perfectly, as I ascertained by tasting it.

In searching for medicagos in an old cemetery back of Amizmiz I discovered a bush of the *Ephedra altissima* in full fruit, and from the seeds of it I sent in, there are already large plants growing in California. There is an especial interest in all the ephedera just now because the ephedrine obtained from a Chinese species is being used in the treatment of sinus diseases.

Barley was ripening in the foothills and the reapers were gathering in the dwarfed, poorly-stooled grain. I watched a little group of about twenty-five men, each with a sickle in one hand, the other protected by an armpiece of wood, working the whole brilliant afternoon on a patch of barley that a modern harvester would cut and bind in a single hour. They were so busy with their work that even the sight of a stranger with a camera did not stop them. I imagine it gave each one of these Berbers as much physical satisfaction to cut the few bundles of short barley that constituted a day's work as it does the American boy to drive his forty horses over twenty acres of wheat. It is not the size of the act nor the value of the thing accomplished that determines the feeling of satisfaction which comes from physical labor, and I believe this fact accounts for much of the lethargy which permeates the lives of field laborers and makes them resist the introduction of labor-saving machinery.

Primitive butchering methods prevail in the Great Atlas.

One of the most annoying accompaniments to collecting in Morocco in spring is the ever-present *Stipa tortilis*, a pernicious



The barbed seeds of *Stipa tortilis* when dry, turn and twist as they burrow into one's flesh, just as they do when they bury themselves in the ground.

grass that burrows its sharp-pointed seeds through everything you have on. Monsieur Tornezy, who was a delightfully enthusiastic naturalist as well as an agriculturist, took us out one day to see a solid stand of this grass covering an area of thousands of acres. It looked like a field of very dwarf barley. The seeds with their twisting awns were falling and boring their way into the ground. Monsieur Tornezy explained that this was a valuable wild grass for goat pastures in spite of the dangerously sharp seeds because the Berbers have worked out a technique by which they can use it. They pasture the goats on it in the spring, then in the early summer as the seeds begin to ripen they drive the flocks off and wait until the seeds have dropped their awns and burrowed under the ground. The goats are then driven back and feed on the dry stems of the grasses that are left standing. It is a poor forage of course, but it does persist on these extremely dry plains where little else will grow, and used in this way the goats cannot exterminate it.

Now that Wheeler was along every insect that we saw took on a new interest and in these great patches of Stipa we found some harvesting ants, the *Messors,* solidly established, their radiating avenues, swept clean of every kind of vegetation, extending hundreds of feet in every direction from the central bins and nests. It is amazing the amount of seeds that are stored in the underground chambers of these messor ants.

CHAPTER XV

MOGADOR AND AGADIR

THE days slipped by, each one full of interesting experiences, but it was getting hotter all the time, the yacht was coming for us and we wanted above all things to see the argan trees and Mogador before it should arrive, so reluctantly we turned our backs on Marrakesh. We also took the precaution to secure from the general in command in Marrakesh a permit to visit Agadir, as it is not open to visitors, and even many old residents in Morocco have not yet been there.

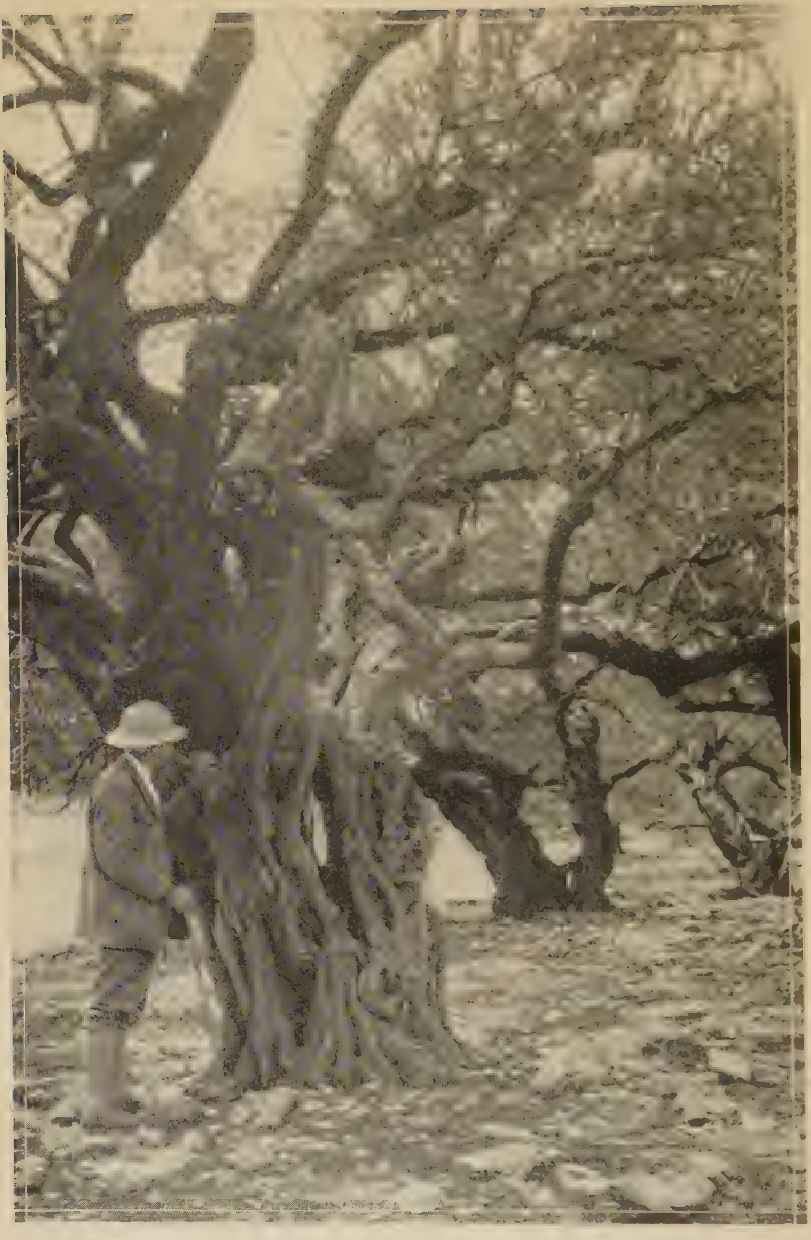
It was glaringly and oppressively hot on the long run from Marrakesh to Mogador and the monotonous plain was enlivened only by the "sand devils," little whirling cones of dust, like miniature waterspouts, but at last we neared the coast and came suddenly into a forest of argan trees. On either side of us stretched away to the horizon what looked like orchards of old buttressed apricot or plum trees laden with ripening fruit. I could scarcely believe that I was in a natural forest and that the trees, centuries old, had not been planted by man. I shook down some of the fruit which looked good enough to eat, something like medium-sized plums with tough skins. I sank my teeth into one. Whew, but it was awful! How the cattle and sheep and goats of Morocco must have struggled to learn to like them! Perhaps it helped that there was nothing else to eat.

For the next week the argan tree (*Argania sideroxylon,* R. et Sch.) became our chief interest, for it covers with its spreading crowns and gnarled, buttressed trunks, over a million acres of Western Morocco. It is peculiarly and closely adapted to the remarkably equable climate and calcareous soil of this region where it must have been growing for many thousands of years.

It is found nowhere else in the entire world. Because of its power to resist long periods of drouth and still remain green and bear large quantities of plum-like fruits, it has brought into existence a curious civilization, and one that seems entirely dependent on this one tree. It furnishes the only forage for goats, sheep and cattle for months at a time, and also supplies all the oil used in cooking.

I had come to see if this was a culture which could be taken to our arid Southwest with advantage, but when I saw the slowness of growth and the character of the fruit, which yields oil only from the small seed kernels, I realized that the establishment of the argan as an orchard industry in America was quite out of the question. If there is scarcely an apple orchard which has not changed hands one or more times before it became a paying proposition, what could be hoped of such a tree crop as the argan? Three generations would pass before it would be profitable. Yet here in Morocco it was a valuable support for a civilization, a miserably poor civilization it is true, but one composed of a pas-

A forest of argan trees looks like an immense orchard, but one in which no two trees are alike.



Like the olive, the argan tree grows slowly, but lives for centuries on the dry lands back of Mogador. Its fruits are said to be a host for the Mediterranean fruit fly, but the idea of cutting them down in order to rid the country of the pest is not one entertained for a moment by the authorities, as the substitution of a better crop would not be easy.

toral population of rugged character and industrious habits. When I tried to think of some substitute for the argan tree that could be introduced and be worth more to the Berbers I saw how difficult it would be. A four-century-old argan is more profitable than any newly introduced plant was likely to be for at least a quarter of a century. And what would the people be doing in the meantime? You are dealing with generations, not years.

But we were not yet in the real argan region at all, as we later discovered. That lies southeast of Mogador, stretching away up into the Sous Valley from Agadir. So we pushed on to Mogador and as we approached the dunes of sand surrounding the town I saw to my delight the characteristic slender leafless bushes of the retama. We all scrambled out to collect what seeds we could, not knowing that next day we were to be presented with a bushel or more of them.

Our friends who have heard us talk about Mogador accuse us of having lost all perspective with regard to it, and I admit it. I cannot write about the place without a certain feeling of emotion. Of all the places I have ever visited it seems to me the most romantic. "Far away and long ago" are words that always send a sad but pleasant sense of longing through me, the sighing of the wind through the pines brings a similar feeling, and the name of Mogador does the same. Something of Poe's "Raven," "Lenore" and "nevermore" hang around my memory of the place. Rhymes kept forming themselves in my head all the time of our stay in the drowsy little town by the sea:

Camels walking on the shore
Sea and sand and nothing more.

and so on, indefinitely. To this Wheeler added, after a day spent back of the town with Graham:

Insect fauna mighty pore
On the coast by Mogador.

We spent little time in Mogador itself—only long enough to walk on the old Portuguese ramparts and to buy amber in a Jewish bazaar and to join the few other Europeans in the café near the little plaza, to sip vermouth, look at the passing people, and hear from the minaret the Muezzim's call for prayer.

From the heights above Mogador where I went with M. Beauchamp who is in charge of the extensive reclamation work the French are doing, I could see how the winds from the Atlantic were sweeping the sand from the beach in great drifts and carrying it inland. The town was already surrounded by dunes and one could plainly see that it had required a constant struggle of the inhabitants to prevent its being entirely covered up, but occupying nearly a third of the sand area I could see how the green vegetation of M. Beauchamp's planting was controlling the dunes completely. It was an inspiring view. Incidently I should like to go there in spring some time and catch the perfume from the retamas when they are in bloom, for he has

The retama bush, (*Genista monosperma*), one of the plants with which M. Beauchamp is holding the drifting sand dunes which were threatening to overwhelm the town of Mogador.

used this bush extensively on the 8400 acres already reclaimed from the 33,000 acres of drifting sand.[1] Thanks to him, considerable quantities of the retama seeds were sent to America for trial, but with what success it is yet too soon to say.

We also went with Monsieur Beauchamp to see the nurseries where he grows plants by the hundreds of thousands for this work and found them models of ingenuity. He had built his windbreaks in such a way that the place was a series of little sheltered

Left—Tons of retama seeds for use in reclaiming the sand dunes of Mogador. *Right*—Retama growing in the Plant Introduction Garden at Chapman Field, Florida, from seed given us by M. Beauchamp.

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[1] In addition to *Retama bovei* he is also trying many other species of sand binding plants, chief among which are the following: *Callitris quadrivalvis, Ononis angustissima, Ononis serrata, Rhus albidus, Lotus salsmani, Tamarix speciosa, Nicotiana arboreum,* so-called, probably *N. glauca, Polycarpea nivea,* and a grass called the "Gourbet," which he says is used in France. I think it is the same thing as the "Sea Bent Grass" used in Holland and America for the same purpose. American botanists prefer the name *Genista monosperma* to *Retama bovei.*

squares which the wind could not very well get into. There his women water carriers, barelegged to the thigh, but with their faces veiled, were watering the sand-binding plants from shallow wells conveniently placed for their use.

Mrs. Fairchild kept thinking about the permit to enter the "Zone d'Insecurité." She had talked with people who had lived in Mogador for years and had never been allowed to go to Agadir. That made her want to go more than ever. Wheeler and Graham, on the other hand, had made a trip along the road and had brought back a very discouraging account of it, but we thought this was due to the fact that they had had three punctures and had crawled back for thirty miles at seven miles an hour on a bare rim. The permit prevailed, however, and we made an early start for the southernmost city on the coast of Morocco.

The trip took us through a rocky calcareous country so dry that even almonds and olives do not grow well, and only the argan tree seems entirely at home. There is an amazing variety in the forms of the trees; there were areas where they looked as dwarfed as the juniper of the rocky coast of Nova Scotia, due in part at least to the herds of goat and sheep that have browsed on them through the centuries. In other places they seem to have escaped browsing only to be blown into strange one-sided shapes by the winds that sweep in from the Atlantic. We passed under one with so large a trunk that three of us could scarcely encircle it with our arms. Some had spreading crowns and others narrow ones. Some branched almost at the ground and others had a distinct trunk. I even found one with a weeping habit of growth. All had of course, grown from seeds and it seemed to be a variable species with ample provision for cross pollination. Many of them that had succeeded in growing into trees were in the centers of wide bushes where the animals could not get at them without being severely scratched by the sharp spines which everywhere cover the argan. Everywhere they had been browsed upon, even the donkeys stop and pick the leaves from the under branches above their heads. Goats will, of course, eat almost any shrub, and I was not surprised that they found even the tender young spines good to eat. It was then that I recalled a woodcut published by Sir Joseph Hooker[1] in his "Journal of a Tour in Morocco," depicting three goats in the branches of an Argan tree. It is one of the twelve woodcuts illustrating the book, but the picture in my copy was so badly printed that only the lowest goat was easily observable, and Sir Joseph treated the matter so casually that I was quite unprepared for the surprise which came with a sharp turn in the road when we saw across the valley two argan trees full of goats. One of these happened to be a piebald goat and stood out in strong contrast with the dark green vegetation of the tree. Catching up my camera I ran across to see these aboreal animals. I reached the tree and stood under it, snapping my camera as fast as I could, and standing almost directly under some of them so that I could get their silhouettes against the sky. They were not aware of my presence for some minutes and I had time to study the method by which they climbed into the topmost branches, cropping right and left at their leisure. A close examination of the larger branches of the tree showed that the upper sides had been flattened into actual runways by the sharp hoofs of many generations of animals traveling up and down on them. They were even broad enough to allow a goat to spring from one branch to the other and stand there on its hind feet while it browsed. When the animals saw me they scampered down the tree trunks and away across the valley.

We met this same herd of goats at the same spot on our return from Agadir and I persuaded the goatherd to show us how he got them to feed on any particular tree. First he struck with his staff on the tree, making quite a noise to attract their attention. Then he threw rocks up into it which broke off small twigs as they tore through the dense branches and when the goats saw these green bits on the ground they lost no time in jumping and scrambling up into the tree to browse. (See frontispiece.)

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[1] Hooker, Joseph D. and Ball, John, "Journal of a Tour in Morocco and the Great Atlas." Macmillan & Co., 1878. Woodcut, p. 97.

It is half a century since Sir Joseph Hooker described this scene and in the preface to his "Journal" he remarks, "up to the time of this visit, the Great Atlas was little better known to geographers than it was in the time of Strabo and Pliny" and "from a comparison with the accounts of early travelers no notable change is apparent during the last two centuries," so I am conscious that I am giving an account of something pretty old. In spite of this I do not always find it easy to get people to believe my story until I show them my photographs. The goat has been a domesticated animal and an associate of man since the Stone Age and as there are many indications that the Berbers, whose origin is still a matter of mystery, may be a very ancient people, the idea is at least permissable that this practice of herding the goats in the argan trees may be one of the most ancient of customs.

After passing through this stretch of argan forest we came out on the African coast, and for the rest of the way to Agadir were most of the time in sight of the headlands and beautiful beaches of the great continent. I wonder if there are any other places where one can see camel trains on a sea beach. We had so associated camels with the desert, that when we saw them pacing with their awkward strides where the surf almost washed their feet, we could not quite adjust our preconceived notions to the situation.

There were a number of interesting plants, some of which were native to the great Sahara and not commonly found so near the coast. Stretches of *Euphorbia bomeriana,* a species related to the handsomer *Euphorbia resinifera* which we saw near Marrakesh, both related to those succulent Euphorbias characteristic of the Canary Islands, would be of interest to those who are studying dry-land rubber plants.

In one of the ravines we found a lone specimen of a weird and not unattractive tree composite, looking for all the world like a yellow-flowered artichoke, only it was ten feet high. Maire declares it is a true denizen of the Sahara and is somewhat out of its range so near the coast. We gathered all the seeds there were on the tree but had a good deal of difficulty with the stiff brittle pappus with which the seeds are provided. They got into our clothes and our hands and were very annoying. The tree bears the name of *Warionia saharæ*, Benth and Cosson, and certainly deserves to have a place in the desertique gardens of our Southwest. It is the sole representative of its genus.[1]

Wheeler, I fear, more than ever found the "Insect fauna mighty pore" though he did discover an interesting parasitic fly in the white-shelled snails that often cover the jujube bushes beside the road. We had a time cutting open the shells to show the larvæ curled up inside of them. By some people in Morocco the jujube is considered a pest, while the snail they consider a pest when it lives on fruit trees, but a benefit when it eats the jujube. What is then a pest? It depends upon whether ones' point of view is biological or economic.

Every detail of the car ran smoothly and the ride to Agadir will remain for a very long time in our memories. The road had all the charm of a great "Corniche," and we felt the excitement that comes from being in a wild uninhabited region. But Mrs. Fairchild kept wondering how we would know when we came to the forbidden land. Suddenly we turned a corner and there, by the side of the road appeared a very small wooden placard bearing the words,

"Zone
d'Insecurité
Acces Form *mt*
Interdit"

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[1] The specimen of Warionia which we found is located in a ravine 16.7 miles (not kilometres) north of Agadir, and any traveler reading this book, who might pass that way, would be doing a kindly act to collect seeds of it and send them in to the Department of Agriculture, Office of Plant Introduction, Washington, D. C.

It was enough. From the time we passed that little sign we felt we were in a land of mystery, touching the edge of that almost unknown country which stretches away to the eastward between the ranges of the Great and the Little Atlas following the course of the Sous River. It was thrilling to think that one could take a caravan from Agadir and, if he could stand the hardships, travel two thousand miles straight away until he reached Lake Chad, never getting out of the desert, a distance corresponding to that between New Orleans and San Francisco. With such a back country, much of it little known, I did not think it strange that the hotel keeper at Agadir should speak with some concern with regard to the safety of the isolated little settlement in which he lived, for now that the Rif War was in full swing, who knew how many Riffian sympathizers there might be among the inhabitants of the great Sous Valley. "What chance has a little fort like this against the hordes from the interior should they choose to attack us," was the tenor of his conversation.

Once installed in the little frame structure that constituted the hotel, café, and ballroom of the town, I made an effort to get a taste of argan oil. The wife of the proprietor declared it was just as good and perhaps a little better than olive oil, provided it was properly used. Its peculiar odor can be easily removed by putting a bit of bread or an onion in the pot while it is heating. She was kind enough to cook our dinner for us with argan oil and, as I suspected, unless one's attention were attracted to a slight, peculiar flavor, one would not suspect anything but olive oil had been used. It does not appear to be very abundant even in Agadir, for the only specimen I could buy was a beer bottleful which a ragged old man brought to the hotel next morning. It is no wonder, perhaps, that I could not get it even in the region where the tree is indigenous, for the yield is only about three and a half quarts to the acre, and the total area of a million acres of argan trees would give only thirty-five hundred tons of argan oil if all the nuts were harvested. The process of getting the oil can hardly have changed in two thousand years, it is so incredibly primitive. The goats eat the fruit and drop the undigested stones in the corral, then the women pick them out of the manure, crack them between two stones and try out the oil over an open fire. I cannot get accustomed to the fact that intelligent people should settle down in such a region with such a crop, condemning themselves to a life seemingly bordering on starvation. I presume, like many of us, they love the desert with its sunshine and free open spaces, and after all, perhaps they lead as pleasant an existence as do the builders of steel ships in the smoke and fog-laden atmosphere of the river Tyne.

We spent only one day in the Sous Valley, motoring toward Taroudent, all the way through argan forests, the character of which changes after one passes Agadir. In place of the calcareous hills with their browsed-down trees one finds what look for all the world like badly-planted orchards of seedling fruit trees stretching away on all sides from the road. The ground was strewn with fruits, much as it is in the prune orchards of California.

As for the river Sous itself, it had practically been swallowed up by its sandy bed, leaving only sluggish pools to show where it should run. I could not imagine its ever having much water in it even at the flood season.

The character of all the natives we passed made me think that a trip into the valley might not be fraught with any unusual risks. There is much disagreement with regard to the origin and distribution of the different races of people in Morocco, but it is generally conceded, I think, that the Berber race inhabiting the great Sous Valley is of very ancient lineage and is in some way related to the Kabyles of Algeria and to the Riffians. From what little we saw of them we were inclined to agree with Hooker that they are "decidedly superior in intelligence, in industry, and in general activity to their neighbors." Certainly they seemed attractive, friendly people, gathering about us as we stopped for lunch and when we were interested to see what the women were carrying in covered baskets on their heads they insisted on giving us the contents, the palatable "kus kus," so we returned the courtesy with biscuits and lumps of sugar.

We were exceeding the terms of our permit which was only for Agadir, and the collecting was pretty poor, so we went only about forty miles up the valley and then retraced our road as the sun was setting through the argans—a beautiful pastoral scene. After spending a second night in the little hotel at Agadir, we left the following morning for Mogador.

There is always an excitement connected with the return from the wilds to the place where one's mail is, but I do not care to be met again with any such news as we found waiting for us in Mogador, for there was a wire from Consul Russell in Casa Blanca saying our daughter Barbara was ill and he had been for five days trying to locate us "somewhere in Morocco." I rushed downtown to the telephone office, for be it known the Protectorate is covered with a telephone system, but the hour of six had struck and the office was closed. The fonctionnaire was just leaving the building and it took all the powers of persuasion that I possessed to induce him to let me try to get Casa, for he met me as government telephone operators always do, with a shrug, and the information that the Casa telephone office would be closed too. However, I got Russell and found that Barbara was better and that our friends the Arthur Bullards in Geneva were anxiously waiting to hear if we could get back in time for our daughter's appendicitis "party" which was already overdue.

I was reminded again of Mr. Hoover's inquiry as to whether one had to make decisions on a collecting trip. One does. Things have to move fast when one's fears are aroused. We hired an open Renault car and a man to drive us, left Wheeler and Graham to follow later and were in Casa the following afternoon, but too late to catch the last boat for a week. The Latecoère Company was running some tiny postal planes to Marseilles so we went to look at them. An Arab was soldering up one of the radiators in a clumsy manner that did not reassure me in the least, but it was the only way out. Mrs. Fairchild decided she would take her chances and fly across the Mediterranean rather than spend four days going across Spain by rail or wait another week for a boat, while I was to stay and meet Mr. Armour who was due in a week on the yacht. I decided to fly as far as Rabat with her.

If you have stayed awake all night worrying, and risen at the screech of dawn, motored to a strange flying field, climbed into an open plane, and seated on some mail bags behind a French pilot whose conversation is obliterated by the whirr of the propeller, flown forty miles watching the surf break on the shore below you as the dawn approached, you can appreciate what a thrilling experience it is.

We pointed out the pleasant places in the road below us where we had stopped to gather plants and insects a few days before, and tried to keep from wondering about the safety of the plane. In forty-five minutes we were in Rabat where I had to stay. There was a short wait and then I helped Mrs. Fairchild back into the little plane, there was a whirr, a turn over the field and a wave of her hand as she disappeared in the gray of the dawn above my head. I thought, as I turned away, of how we had stood together in a potato patch in Hammondsport, New York, in 1909, and witnessed the first flight ever made over a measured course when Glenn Curtiss won the Scientific American Trophy, and pondered on the incredible progress of the world since then. In sixteen years' time that fragile thing of silk and wire we had seen pass over us had become so perfected that even from the wilds of Morocco one could fly across the Mediterranean.

It was a thirteen-hour flight and I expected a wire the following day, but none came, so I tried to find out from the Company whether the plane had arrived and received an assuring telegram saying it had reached Marseilles on time, all of which was quite untrue, as a leaky radiator had caused a forced landing on the sea beach near Valencia, with a consequent delay of over twenty-four hours. However, Mrs. Fairchild had eventually arrived safely and I soon had news of the successful operation.

There was just time after Mrs. Fairchild left and before the yacht arrived, to go to Azrou, the place we had not been able to visit from Meknez because of the late spring. The unusual amount of rain that falls in that part of the Great Atlas makes it a kind of wet oasis in a dry country, where all kinds of plants and insects seem to gather and enjoy themselves. It was a relief and delight after the dried-up fields, to wander again over pastures almost as green as those of Switzerland. The number of beetles was amazing, the weeds by the roadside were alive with them. I think Wheeler said he had never seen such masses of them and he and Graham were at last satisfied, in a measure, with the collecting.

We put up in a delightful little inn at Azrou, a town scarcely more than a military post which keeps a lookout on the suspicious valley beyond. We made an excursion to the "big trees" of the Atlas, the Atlas cedars (*Cedrus libanotica,* Link, subsp. *atlantica,* Man Holmb.).

I shall have to confess that I had my mind made up for larger trees than the old giants of Azrou proved to be. Of course they pale completely in comparison with the redwoods or the *Sequoia gigantea* or the Douglas fir, all of which are in quite another class. It was interesting just the same to see in their original habitats, the parent trees, so to speak, from which have come the hundreds of beautiful trees of the *Cedrus atlantica,* as it is known to most of us, that have been scattered everywhere through the temperate climates of the world.

When Hooker visited Morocco in 1878 he was not certain that the Atlas cedar occurred there, although there was a rumor that a venturesome traveler south of Fez had seen some large "larch" trees which Hooker surmised were Atlas cedars. He reported the "larches" as being four feet through, and those we saw at Azrou were none of them larger than this. It is often the case that one finds the trees of such species as this really handsomer when cultivated in some great garden than out in the wilds where they are subjected to the struggle for existence. The finest Douglas firs I ever saw, the most perfect specimens, were at Murthley in Scotland and not on Mount Ranier. Perhaps it is not surprising that the cedars of Azrou did not seem to me so wonderful as some of the great specimens I have seen on British and European estates. Larger they were, but badly weathered.

Among the ancient Atlas cedars of Azrou; Dr. Wheeler in the foreground.

Almost under the very branches of the cedars I saw for the first time a shrub that struck me as having the softest, most velvety leaves I ever felt, and I have in my lifetime touched a great many leaves of different kinds. I saw it later in bloom farther down the mountain. It suggested a beautiful yellow-flowered lilac, were there such a thing. The clusters were about the size of those of the lilac and the glorious golden-yellow flowers stood out against the leaves as though they had been placed against a background of green velvet. I lost my heart to it at first sight, and the fact that my friend Maire had discovered it there under the Atlas cedars and had named it after the distinguished French botanist Battandier, the almost life-long associate of Trabut, added much to my sentiment about it. *Cytissus Battandieri,* Maire, since it grows under the same conditions as does the Atlas cedar, one might conclude would thrive wherever that tree does, but I fear it is a much more selective plant and will always demand something approaching the equable temperatures and continual moisture which characterize this moist little oasis in the dry mountains of the Atlas. While, of course, I was delighted to see it in bloom, I regretted tremendously not being able to get the seeds of it at once. I had to content myself with digging some young plants of it and writing to Maire, who later sent me some seeds. I do not know at this writing whether there are any plants of this superb shrub growing in America. I did not see it in any of the European collections.

Battandier's lovely golden-yellow flowered Cytissus as it grew on the mountain side near Azrou.

My own collections at Azrou were not so extensive as were those of Wheeler and Graham, but when I look over the amount of material I was able to get together during the whole trip through Morocco I am not dissatisfied. If even a few of them really succeed and grow in America I shall be delighted.

As for memories, they will fill my mind for the rest of my life. The souks filled with swarming humans, Jews, Arabs, Berbers; the great open deserts with Wheeler calling us to come and see one of his ant colonies; the unrivaled beauty of the Koutubia in Marrakesh, than which there is no more finely proportioned tower in the whole world; the flowers in the Forest of Mamora; the Gardens of the Oudaias; the oasis of palms of Marrakesh; the shrubby vegetation of the Atlas, the curious euphorbias, the retamas and most of all the fascinating argan forest, all of these are lasting memories.

CHAPTER XVI

ON THE UTOWANA TO TENERIFFE

THE Utowana was due at Casablanca the 19th of June, destination still unknown. Mr. Armour had cabled to know whether, on account of the war activities, there would be any difficulty in finding a berth for the yacht in the harbor. We motored to Rabat and on to Casablanca, where at the port the jolly Harbor Master smiled when I put to him the question of a berth for the yacht. "Oui, il y a beaucoup de place, monsieur." It is true there were troops in the streets and the cafés were spotted with officers, but at that time the war made little difference in the lives of the residents. To be at war had, I suppose, become almost the normal condition of society among the French.

How shall I describe Utowana as she sailed into the harbor of Casablanca on that morning in June? I knew she was 230 feet long by 33 feet 10 inches beam and 1315 tons weight; that she drew 11 to 12 feet draft and was provided with two Atlas Diesel 500 H. P. engines capable of pushing her through the water at 10½ knots an hour. I had heard Mr. Armour say he could victual her for a six months' cruise, that she had tanks carrying 200 tons of water and enough oil for a cruising radius of 12,000 sea miles, and that there was a crew on her of 30 men. But as she rode at anchor in Casablanca she was nothing short of a floating palace to us. And when we scrambled on board and found how Mr. Armour had arranged everything for our convenience, from microscope tables and typewriting desks to sinks and dark room and places for the wardian cases which were to be built to house the living plant material, we were in a bewildering kind of Paradise. The promise held out in the cablegram which had been handed to me in Panama almost a year before had at last come true, thanks to the Genie, who had sent it and had followed it up with a persistence of effort which at one time threatened to wreck his health. It had been true, as Wheeler had predicted, that many things would happen between the time of the receiving of the cablegram and the coming of the yacht, one of which was that he himself would come on board with us in Casablanca and make the first cruise with us. But I had not counted on Mrs. Fairchild being left out of it—she was included in the invitation, and almost the first question from Mr. Armour and his old friends Mr. and Mrs. Jordan Mott was "Where is Mrs. Fairchild?"

After the yacht's company had taken a glimpse of Casablanca and Rabat from QQ, and we had managed to hoist that trusty car into the forward hold of the yacht, where she remained until our arrival in Genoa months later, the Utowana pulled out of Casa for Gibraltar where certain supplies had been left and where she got a last coat of white paint.

Those first mornings on the yacht, how can I describe them! The library of floras of the eastern tropics had to be arranged, the microscope tables had to be equipped, the dark room needed all sorts of attention. Everything was *couleur de rose.* Each morning coffee was served in the library and we sat for a half hour in our djellabas, or Arab wrappers, and listened, as we sipped our coffee, to Wheeler's rendering of Bernard Shaw's Cæsar and Cleopatra, which resulted in his acquiring the unearned title of Tatatita for the rest of the cruise.

While the yacht was being painted in Gibraltar the members of the so-called Scientific Staff were able to make a short excursion to the Sierras of Southern Spain.

My own particular quest on this excursion, aside from the collecting of some new retamas and a number of medicagos and hedysarums was to see if there was a late flowering almond of good quality among the seedling almond trees that for forty miles or more line the railroad track north of Boadilla.

When Mrs. Fairchild and I had been in Spain in 1909 we had seen these trees in full bloom from the train and I thought then that it would be worth while to study them some day since they represented probably the largest number of seedling almond trees in the world. As soon as we reached Ronda I found, in talking to the manager of the hotel and the gardener, that the whole of Southern Spain had been visited by a severe late frost in March and most of the almond blossoms had been destroyed. Here was my chance to see if among the thousands of seedling trees, there were any that had flowered so late as to escape the late frost. I felt that to discover a very late flowering almond would be well worth while, providing at the same time it proved to be of good quality, for the greatest enemy of almond growing in California is the spring frost that comes too frequently to make almonds a profitable crop in many sections.

I set off for Boadilla by train and found the almond trees still standing, a solid line on each side of the road. I walked for miles up the track examining the trees but not a single sign of an almond of any description was to be found. The frost had been too heavy and it had also been too late. It had caught every blossom and every fruit that might have set. The test had been too severe and my second trip to Boadilla was a failure. Some day perhaps, I shall try again.

Southeastern Spain, seen after a spring in Morocco gives one a most distinct impression that its agriculture was more influenced by the Moors than we ordinarily think. How much of this apparent similarity is due to the effect of a similar climate it is hard to say. Twenty years ago Mrs. Fairchild and I wandered over the hills from Ronda to Grazalema on muleback, to-day a good motor road connects the two towns, but in the agriculture, one can see no changes in those years, any more than there appear to have been made any changes in the practices of the Moors since the time of Pliny.

There is always a peculiar fascination about a great forest of the evergreen oak (*Quercus ilex* var. *rotundifolia,* Rehder), such as that on the Montilirio estate back of Ronda. Trabut had once told me of the edible acorns he and Swingle had eaten in Southeastern Spain years before, and I was curious to see if these oaks around Ronda were of this type. I found that the trees were all from seeds, none being grafted as I discovered later they are in the Balearic Islands, but nevertheless the people eat the acorns in considerable quantities. Here again in these century-old oaks we have an example of a culture which has developed about these old trees, more because of their power to bear great quantities of acorns than because those acorns may be more valuable than some other crops might be. For its beauty alone and for the hog food which it yields I think this Mediterranean oak should be more widely distributed throughout Southern California.

Growing under these oaks were interesting patches of various leguminous plants which evidently add a very material richness to the "range" on these hills. A vigorous-looking species of the Mediterranean genus Lotus (*L. filicaulis,* Dr.) grew luxuriantly in great patches under the trees and I collected seeds of it for the pastures of Southern California. The beautiful species of Cistus, or rock roses, that formed great masses of dense bushy vegetation all over the hillsides should make any flower lover envious to have a complete collection of the twenty or so species of these lovely rock roses and their many hybrids.

It had been determined that in order to try out the yacht we should make a preliminary cruise in the archipelago of the Canary Islands, so although the flowers being over and seeds ripe, we would gladly have pushed on into the mountains, we had to retrace our steps to Gibraltar. The Admiral in command of the Rock, Sir Stapleton Cotton, like so many of the English officials of high rank, was passionately fond of flowers. He invited me to spend a morning with him in his garden on "The Mount" where he was engaged in making some new terraces to fill with flowering plants. The labor involved in taking out the large boulders to make room for good soil impressed me. I suppose it is this initial expense which prevents Americans from making terraces, the only ones I have seen at home being on millionaire's estates in Southern California. They are so peculiarly beautiful when well done and make such ideal places for flowering trees and shrubs and bulbous plants that it is a pity we can have so few of them.

It was the sixth of July when the Utowana dropped anchor in the harbor of Vera Cruz de Teneriffe. It was early morning, the clouds hung low over the mountain peaks and in the early daylight the valleys, or barrancos, seemed filled with mystery, a mystery in harmony with the strange romantic history of the islands. Here we were in the center of an ancient archipelago of seven islands which, although on any atlas they are scarcely large enough to be visible, have absorbed the fancies of philosophers and scientists for generations. Did the volcanic peaks which rose above the water represent merely upheavals from a sea bottom that had never been exposed to the atmosphere and sunlight, or were they what remained of the lost Atlantis which Plato imagined had sunk with its millions of living inhabitants into the sea in a single day? Were the caves of which there are hundreds in the barrancos, and in which centuries ago lived one of the most remarkable of the now extinct races of mankind, the abodes of a people related to the Iberians of Western Europe? Had they any relationship with the Cro-Magnon remains of prehistoric man discovered in central France, or were they descended from adventurous Berbers who had sailed away from the coast of Morocco and been stranded on the shore? What has become of the dense forests of Canary Island palms and the Canary Island pine, and the Til forests which in those days covered the slopes of the barrancos and under whose shade these same Guanchos lived?

I doubt if there is any other archipelago in the world that approaches this one in its wealth of ancient romance. The

Canaries seem to have been in Homer's mind as the islands, beyond the Pillars of Hercules to which the souls of departed heroes were transplanted and which he called Elysius. Herodotus referred to them as the Gardens of the Hesperides. The King of Mauritania in 50 B.C. sent ships to inspect them and brought back two large dogs and so originated the name Canaria, the place of the *cane* or dog. This same king seems to have placed them as lying at the limit of the then flat world, and Ptolemy drew through them his imaginary meridian line on the extreme west of the known world.

Samler Brown in his most remarkable book on the Islands has gathered together the most amazing details regarding the lives of the extinct Guanchos. The customs and practices of this race seem to have been remarkable. The sex taboo was so highly developed that the men and women had separate trails through the barrancos in some of the mountains; a child was put to death for insulting its parents; adulterers were buried alive; robbery was a capital offense, as well as was the crime of approaching too near to the bathing place of the Consecrated Virgins; the fear of over-population was so great that a man was liable to be put to death for merely speaking to a strange woman on a public road, and child murder was a legal crime.

They invented a new method of preparing grain for food which is in use to-day. The whole grains were first roasted, then ground and mixed with water to form the popular dish called *gofio.* They considered the flesh of castrated puppies a great delicacy, and their domesticated animals included the sheep, goat, pig, dog and rabbit. The shepherds invented a method of whistling to one another across the barrancos in a species of tone language still used in the small island of Gommera, so I was told. In fact a cloud-cap of legend quite as nebulous as the actual cloud girdle which covers the higher altitudes of Teneriffe, seems to have always enshrouded these islands.

I had visited Grand Canary with Mr. Lathrop in 1902 and I knew, as I stood and looked at those superb hills in front of me, that it was going to be just as hard to leave them when we once began to wander over their fascinating surface as it had been when Mr. Lathrop dragged me away from Las Palmas years before. But I had been pretty well schooled in the art of moving on; I hardly expected to discover anything new to science in a brief stay on islands like these which have been the playground of such noted botanists as Webb and Barthelot in 1836, Hartung in 1860, Hooker in 1878, Bornmueller in 1902 and Pitard and Proust in 1908, but I did think it possible that, tucked away among the private and public gardens of the islands I might find rare plants which it would be worth while to bring to the attention of the gardeners of America. I knew also that in the early days of botanic gardens in Europe there had been established in Orotava on this island of Teneriffe one of those Acclimatization Gardens through which it was hoped to bring the gorgeous and luscious fruits and flowers of the tropics by easy stages into the gardens of central and northern Europe. Acclimatization was conceived of as a process by which in a few generations plants that could not withstand any frost would be hardened to a point where they could withstand several degrees of low temperature. Just how firm this belief really was among the early botanists I have never been able to find out. I have always suspected there were many skeptics among the wiser ones as to the time that would be necessary to develop any high degree of resistance to frost. The result, however, was the establishment of gardens at particularly favorable places where there were low temperatures but no actual frosts, and Orotava was one of these. It lies in the mountains but is protected by an oceanic climate that gives it immunity from frosts; but high fogs and haze which shut out the sun in the morning, combined with cool nights, proved to be conditions to which the tropical plants were not accustomed. However, although the theory did not work out, the gardens went on growing and they have served a most useful purpose just the same, for they have proved for each locality what plants will grow there, and can be depended upon to build up new industries when old ones are put out of business by the inventions of science or the changes of fashion.

These were some of the thoughts that ran through my brain as I stood in my pajamas on the deck of the Utowana off the coast of Teneriffe. I was soon interrupted by the insistent preparations to go ashore, for let no one who has not tried it imagine it is an easy thing to drop anchor, slip ashore with a party of several people in a new port, where a new language is spoken, and before you can say "Jack Robinson" be away into the hills where the really valuable things are to be found. There are endless delays and formalities, and a struggle with the dialect of the place, and discussions between members of one's own party as to where to go and how to get back, and when and where to meet, and what collecting outfits and which cameras to take. Even the question of getting local money has to be settled. In other words, you have all at once to bank, bargain with auto driver, translate, read maps, select guide, watch your baggage, and see that all your party know what is going on, especially if they don't understand the language you are speaking and are not always in accord with you as to the vague and often imperfect plans for the day.

I have come to look upon the start-off on any trip as one of the most unorganized and emotionally exciting things in life, and in a strange harbor, among strange people who speak a language you are not a master of, the difficulties are vastly increased and the loss of time multiplied.

But at last we were off for Orotava up a zigzag mountain road. We caught a glimpse of the Pico de Teyde, or Peak of Teneriffe, as our machine passed out of the cloud which, summer and winter, hangs over the mountains, and we unbuttoned our overcoats again and were warm. It is such an amazing and overpowering mountain that I think it no wonder the Guanchos called it the Peak of

Hell, especially since it smoked continually and probably erupted several times in their traditional history. Over twelve thousand feet it rises in a perfect cone from the sea and when its top is covered with snow it rivals in majesty the famous Fujiyama as one sees it from the Bay of Yokohama.

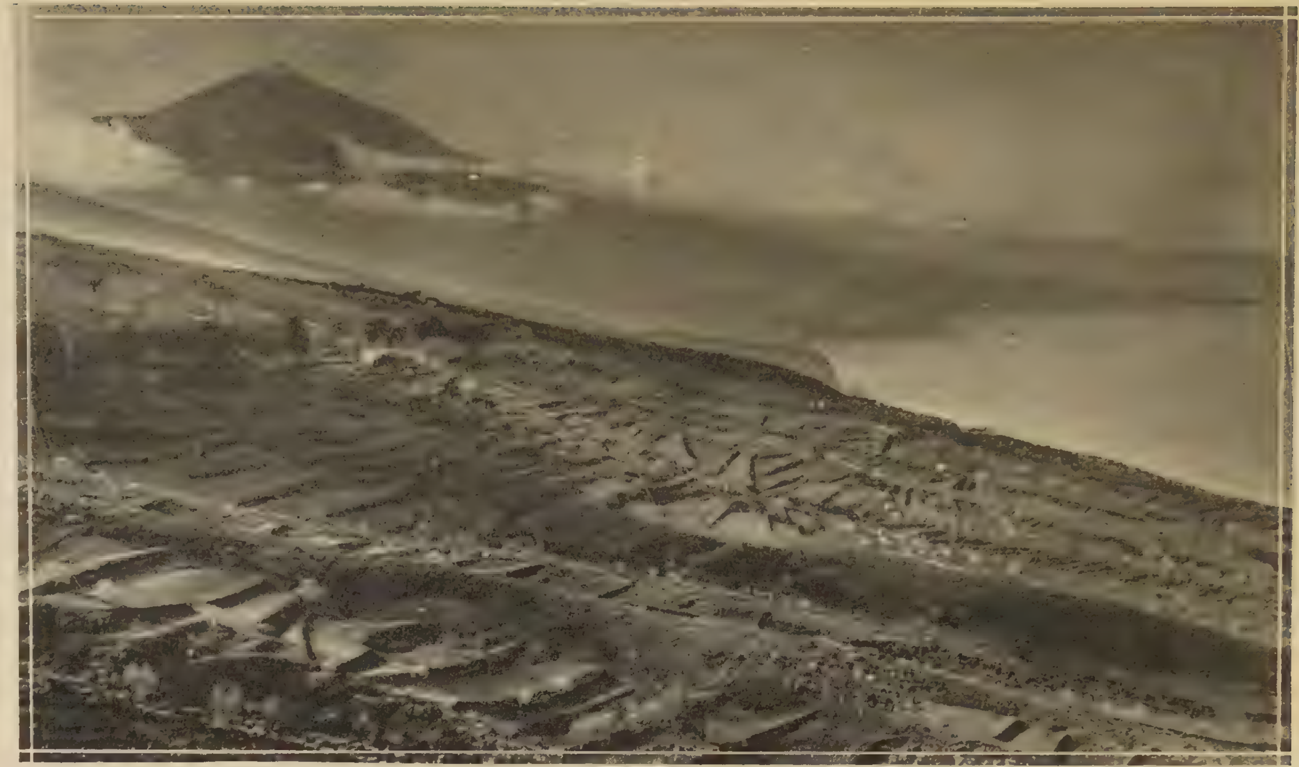
A little farther along on this twenty-five-mile stretch there comes suddenly into view one of the most amazing terraced mountain slopes in the world. It stretches from the Montañas de Guimar, a spur of the great mountain of Teneriffe, down in one magnificent sweep to the surf on the shore. The terraces are all crowded with the broad-leaved dwarf banana and represent one of the most valuable pieces of agricultural land in the world. If you tried to buy any of these terraces you would not get them for less than the incredible price of what would amount to $15,000 an acre.

The history of the banana in the Canaries can hardly be told without reference to the crops which preceded it, and as a place to study plant introduction, these islands can hardly be equaled. Thanks to Mr. Samler Brown, who has gathered together a wealth of facts about the crops on the islands, it is easy to get a glimpse back into the agricultural past of this remarkable region.[1]

When Columbus touched at the Canaries on his first voyage to America, sugar cane was already being cultivated in the islands, but it evidently was a new thing there, for as late as the 16th century there is a reference by Francis Bacon to the effect that being first in an invention "doth sometimes cause a wonderful overgrowth of riches, as it was with the first sugar man in the Canaries." When the culture of sugar cane spread to the West Indies the days of its profitable culture in the Canary Islands was over.

Before the close of the 15th century the grapevine had been introduced from the island of Madeira, coming originally

[1] Brown, A. Samler, "Madeira, Canary Islands and Azores," twelfth edition, 1922. London, Kent & Co.



An incomparable scene of seashore and volcanic peak, and thousands of man-made terraces covered with banana plantations is unfolded as one reaches Orotava, Teneriffe.

from the vineyard of Malavesi in Crete. Canary sack is mentioned by Shakespeare and was drunk commonly during his day. In 1804 the export of Canary wines and brandies amounted to 48,000 "pipes," and as high as $180 per keg or pipe has been paid. About 1850 the American mildew *"Oidium Tuckeri,"* and probably also the phylloxera, attacked the vines and the production dropped until to-day the wine industry is an insignificant one in the islands.

Don Juan Bolinaga and Dr. Wheeler discussing the menace of the Argentine ant on a banana terrace in Teneriffe.

In 1742 a curé of Lanzarote, so the history goes, was captured by the Moors, and while a slave among them, he learned from them the art of extracting soda from the various species of mesembrianthemum, those succulent plants abundant on the coast of Morocco. Returning to his native island he taught his countrymen the art, and started a plant industry in which three species were grown. The discovery of a way to obtain soda from sea water made its extraction from plants unprofitable, but the culture of mesembrianthemums lasted for over seventy years and a fragment of it still remains in Lanzanrote.

Probably the earliest voyagers to Mexico brought back seeds of the prickly pear (*Opuntia tuna*) and it was still an important fruit crop in the islands in 1876 when the first cochineal insects were allowed to be introduced, after much opposition from those who feared they would ruin their orchards of prickly pear. Cochineal was at the time the most valuable of dyes for silks. Since the 16th century the carmine-colored dresses of the rich had all been dyed with the stain from this scale insect, which covers the smooth stems of the cactus with a cottony fuzz, the supply having come from Mexico, Honduras and Guatemala. The introduction of the insect into the Canaries started an industry which at one time brought in nearly $4,000,000, or $15 for every inhabitant. The industry was so remunerative that the cultivators went wild in their efforts to increase their acreage and made thousands of terraces at immense expense out of the lava streams, breaking the rock to make the walls. As Brown remarks, "It is questionable whether any other country can show farms which, foot for foot, have entailed so much wear and tear of sinew and muscle." It is interesting to read in these days, when every effort is being made to restrict crop outputs by organization methods, that when the method of making synthetic cochineal from coal tar was discovered, a company was formed in Orotava to keep up the price by regulating the supply of cochineal sent to London; but the attempt fell through when it was learned that Belgium was producing thousands of hundredweight of the new dye. Brown attributes to the cochineal boom not only the bringing into culture of areas that had to be abandoned later because incapable of irrigation, but "the degradation in the Canaries attributable to the utilitarian style of architecture adopted in cochineal times by choice and continued by habit or necessity afterwards."

With the coming of the banana about seventy years ago, which would about coincide with the beginning of the popularity of this fruit in all temperate regions, came a utilization of the rocky barrancos or ravines, eclipsing anything known in the times of the cochineal boom. As I have said, irrigated terrace lands suitable for banana growing cannot be bought for much less than $10,000 to $15,000 an acre including water rights. Naturally, this is a fictitious price, for even with bananas selling at the highest price, with a maximum yield per acre the gross returns would be only eleven per cent. The fact that the wealthy men of the islands have not yet learned that there are other safe and profitable investments besides land, helps to keep up the high price of real estate. It is also true that man remembers only the maxima of profits, and one hears stories of 2000 bunches of bananas per hectare and prices of 25 pesetas a bunch. This would figure out a gross profit of nearly $3000 an acre, which is fantastic.

What is facing the banana industry nobody seems to know. A slight cloud has appeared on the horizon in the shape of a scale insect (*Phœnocococcus Comstockii*) which until recently did little damage, but which is now being spread everywhere through the plantations by the Argentine ant, which has adopted it as a milch animal, protected it and carried it about from plant to plant, where it feeds on the juices that should go into the fruit. Wheeler showed us this ant the first day we landed. Apparently the ants only arrived from the Argentine a few years ago, but they breed like rabbits, only a good deal more so, and are fast driving the native ants from the lowlands up into the mountains.

Then, too, there is coming into the European market the Honduras banana, which is a better shipper and can be more cheaply produced in the West Indies. The French and many other Europeans prefer the scented flavor of the Canary Island banana, but let the scale insect once produce a lull in the supply of this type and there is likely to be a shift to the Honduras from which I fear it might be difficult for the Canary Island variety to recover. Viewing the ups and downs of agriculture in the islands during the past centuries this is what one might expect and plans should be on foot to find some new industry in the event of its occurrence.

After depositing our baggage at the charming little Hotel

Martianez at Orotava we retraced our route and called at the elaborate wrought-iron entrance to the Jardin de Aclimatacion and I presented my card. I have never received any other than a civil reception, but I could hardly have anticipated such cordiality as was shown me by the Director, Don Juan Bolinaga, when he saw my card. He had never heard of the Office of Foreign Plant Introduction of the Department of Agriculture in Washington, but he had seen in the little *Revue Horticole de l'Algerie* a report of the talk I had given when I was in Algiers on the subject of avocados in Florida. Don Juan was enthusiastic over the possibilities of growing the avocado in the Canaries and immediately dragged me off to show me the trees he had, and to recount his difficulties in their propagation. It was a strong bond, and since he was familiar with a large number of the introduced plants in the islands and was keen to exchange species, I was able to get some interesting and valuable plant material.

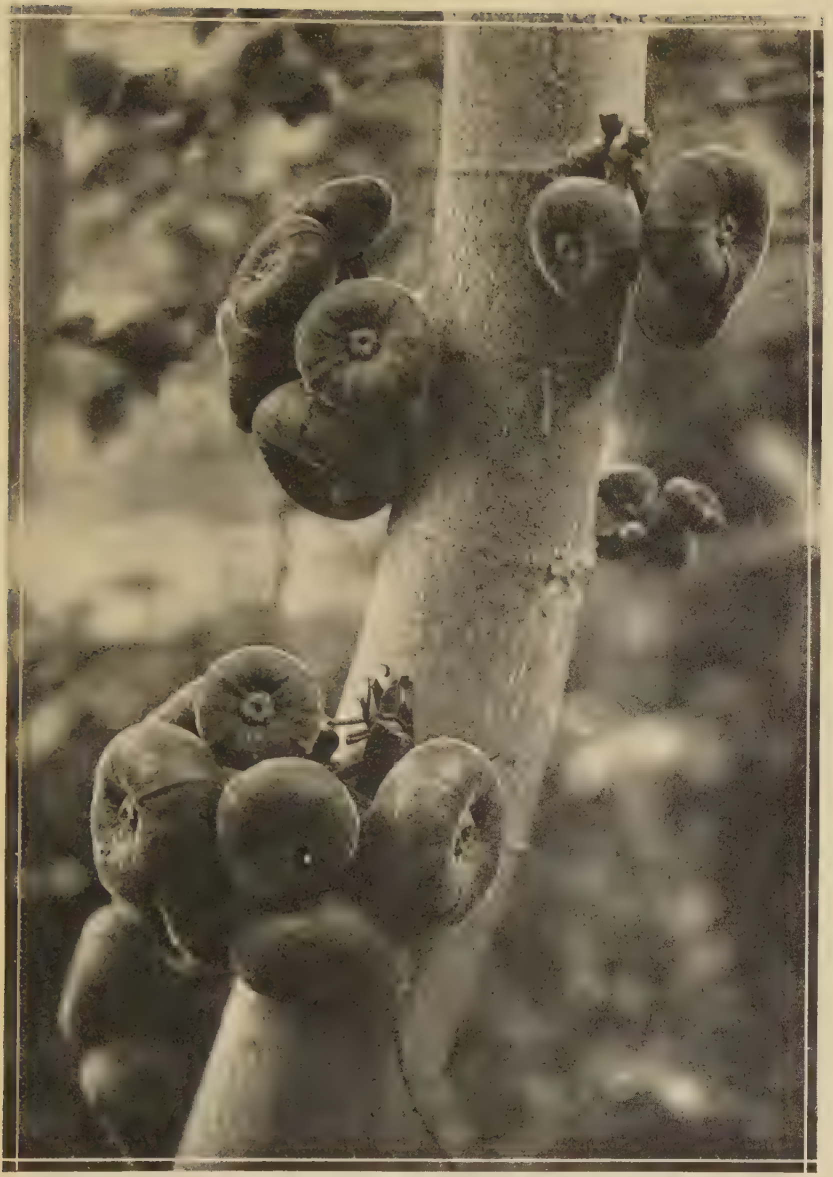
The first look around the garden showed it to be filled with familiar plants. I was surprised to find a good-sized breadfruit tree and the Cuban royal palm side by side. I had thought it too cool for the former. Temperatures, however, never go much below 46 degrees nor rise above 86. In July while we were there the range was from 73 in the daytime to 59 at night, and there is apparently no reason why many tropical plants should not grow well where such a climate exists, except, as I have said before that with high fogs and too little heat many plants which grow, will not behave in a normal way.

A fourteen-year-old tree of the mangosteen was in the collection but I think it had given up any idea of fruiting. A small mango, however, bore small crops of indifferent fruit, rather to my surprise, for I thought it required more heat.

I am aware in trying to present to my readers a picture of this interesting garden that it is about as impossible a task as it would be for me to describe a new game of cards, after having given new Latin and Greek names to every card. Words and even photographs, do not convey the faintest flicker of the joy it is to a botanist to lay eyes for the first time on plants one has read about and heard of and longed for years to see.

The great bell-like flowers of the native climbing *Canarina campanulata* were open. The decorative white-flowered composite *Polymnia grandis* and the tree *Eupatorium macrophyllum* near-by, as well as the *Ferdinanda eminens,* another composite, were in flower. Both the Echiums native to the islands were full of blooms; *E. simplex,* called the "Pride of Teneriffe," with its white spike-like inflorescence ten feet high, was rivalled by the even more showy, brilliant blue *E. fastuosum.* There were many rare tropical species of ficus; *F. suringari* from the island of Amboina, *F. parcelli* var. *variegata,* a striking red-fruited species, *F. cooperi, F. eburnea* from the East Indies, and *F. glomerata,* nine feet in circumference at the base. All of them were attractive trees, showing what this immense genus, of which there are 700 species scattered throughout the tropics, is capable of furnishing to gardens in the subtropics.

The thrill of the Jardin de Aclimatacion to me, however, was to see for the first time a full-grown tree of the Himalayan giant fig (*Ficus Roxburghii*) about which I had read, and a young specimen of which I had once seen in Mr. Coppinger's garden in Miami, Florida. It was an amazing sight; the great trunk was literally covered with the most astonishing masses of giant figs that seemed to come out anywhere, even from the buttresses at the base. These figs are three inches through, flattened and hollow. Like most figs, Roxburghii is dependent on insects for fertilization, but Don Juan informed us that he had discovered a way to do this artificially. The process consists in irritating the flowers, which are inside the fruit, with a small stick dipped in olive oil, a procedure that was used in the early days of the introduction of the Smyrna fig into California before the fig insect was brought in. He also said that the figs so fertilized grew to be four inches in diameter, in fact he



Ficus roxburghii from the Himalayas bears fruits sometimes four inches in diameter on the trunk and large branches, and even at the very base of the tree.

had once divided a single fig among eight people! I told Bolinaga's story to the yacht's company and to my great surprise Mr. Armour shook his head, Jordan Mott made some ribald remark about the fig, Mrs. Mott asked if she could not have some of them to eat, and even Wheeler and my son Graham refused to back me up in the belief that Bolinaga told the truth. To this day I have not been able to convince any of them that the story was not an exaggeration, although Bolinaga later sent me an outline that he drew around a cross section of one of his fertilized figs and it was fully four inches across, while an English merchant in Vera Cruz substantiated his statement that the figs were very good eating.

Whether or not the fig is as good as Bolinaga claims, the tree is certainly worthy of study by those living beyond the zone of winter frosts, who are interested in the fig or in the genus Ficus.

I was in favor of getting a plant from this tree but Bolinaga said that it took at least three years to propagate it so I had to be content with his offer to grow some for me. Three years have passed, and true to his promise he has sent a plant to Washington. Also the tree in Miami has been rediscovered, and steps have been taken to propagate a number of plants from both for distribution to the gardeners of South Florida.

The pride of Bolinaga's heart, however, was a collection of selected mutations of the Chinese banana which he had gathered from the millions of trees of this species composing the plantations of the island. Among them was a dwarf, not over four feet high, and also one with a black stem.

Naturally, when one comes to Teneriffe one wants to see not only introduced plants, but those indigenous to the Canary Islands. I had seen the beautiful *Canarina campanulata* which reminds one of a giant climbing campanula, and Bolinaga gave me some seeds which luckily have grown and flowered in Miss Kate Session's garden in San Diego. There is a drooping cedar which at one time was very abundant, but which is now scarce in

Teneriffe, *Juniperus cedrus.* I could not get any viable seeds in 1925 on our first trip to the islands, but on our second visit Madame Perez of Orotava, whose husband had done much to save the species from extinction, presented me with a quantity of seeds of this interesting tree.

Some of the most interesting native plants are not to be seen in gardens, so it was arranged that Bolinaga should pilot us about. I do not wonder that Teneriffe has seemed a paradise to European botanists for it has not only a fascinating flora but superb scenery and a marvelous climate. Until one has botanized in a barranco one has not experienced one of the most æsthetic thrills the world affords. What the whole island must have been before the devastating hand of man touched it, one can only imagine by visits to the uninhabited places still existing. These require muleback journeys along the brinks of deep ravines and real climbing over volcanic rocks and steep precipitous mountain sides. If one imagines that from the size of the island he can measure the difficulties of its exploration, he will discover he is sadly mistaken, for everything is, so to speak, on end, and the top is 12,152 feet higher than the bottom. The Jungfrau, for example, is only 406 meters higher than the Pico de Teide. The ascent of the mountain is not then an afternoon's affair.

Teneriffe is noted for one type of vegetation in particular, its Sempervivums or, as some of them are called, Æoniums. One sees representatives of this genus in every rock garden, and I thought I was fairly familiar with its range of forms until, as we were driving along the road which leads to the south end of the island and came to a point called San Juan de la Rambla, I happened to glance up at the walls of the barranco we were passing. The sight was one of the strangest I have ever seen. There, spattered like green dinner plates against the almost perpendicular walls of the barranco were immense rosettes of soft green leaves, some of them sixteen inches across. Out of the centers of some of them rose flower stalks each with a raceme of sulphur-yellow flowers. I endeavored to get some good photographs of this species but found it rather difficult, for the finest specimens were in places inaccessible for a camera tripod. Seeds I did gather, however, even though Dr. O. Burchard, whose charming place I visited at La Mocana, Orotava, has by this time pretty well disseminated the seeds of most of the handsome and interesting sempervivums, for he sells them to any who write for them. This particular form is called *Æonium tabulæforme,* but from the fact that in the garden dictionary no particular stress is laid on their ability to lead a perpendicular existence, I wonder if the one commonly seen in greenhouses is the same as that which I saw at San Juan de la Rambla.

Looking like immense green dinner plates, sometimes sixteen inches across, the *Æonium tabulæforme* rosettes were scattered over the walls of the Barranco.

Bolinaga had talked to me about a remarkable composite (*Senecio leptocephalus*) of which the goats were particularly fond, that grows in the crevices of the rocks, exposed to the scorching rays of the sun, and I wanted very much to see it and get some seeds. We found it in a few inaccessible places that had been overlooked by the goats and where it was beginning to make seeds and scatter them about, but nowhere has it made much progress against the ravages of these animals. I saw a goat reach for a bunch of it and there could be no doubt of their craving for it. It is a strange looking plant, with masses of compound leaves bearing linear leaflets and scattered yellow blooms, but the queerest thing about it is that it smells like mice. We succeeded in obtaining a few seeds which were planted at our Plant Introduction Garden at Chico, California. Eighteen months later I was pleased to find there a vigorous plant from which enough seeds might be taken to test this strictly Canary Island composite in rocky, barren regions of Southern California where I hoped it might be spread and add to the value of the great ranges; but alas! it proved too tender.

From the hotel where we stopped a path led down to the strangest strand I have ever seen. Can you imagine, you especially who have bathed on the white coral sands of South Florida, a black volcanic beach, and on this black beach tamarisk trees with pendant branches from which is always dripping a salty water? Just above was a rocky cliff filled with Guancho caves, and on the summit of the cliffs was perched "La Paz," the villa where Alexander von Humboldt visited in 1840. It was Wheeler who discovered the beach and it seemed to have a peculiar fascination for him. He used to slip away, even after dark, and stroll along this melancholy deserted strand where the white waves broke on the black volcanic shore.

One day he and Graham explored the caves under the cliff and to his great delight, there, in the fine dry dust at the entrance to one of the caves, he found the tiny crater traps of the larvæ of a rare fly, *Lampromya canariensis* which lies in wait for some unfortunate ant to slide down into its grasp, much as does the common ant lion. The antics of this remarkable insect and those of a related genus (*Vermileo*) that was later found in the Balearics, were a constant amusement to all on the yacht. Wheeler of course knew the whole history of its first discovery; in fact he was busy with one of his charmingly erudite stories of this very species at the time. He so interested Graham in these flies that everywhere we went the boy was on the lookout for them, and the following year, while in the mountain jungles of North Sumatra, he found another species. It appears that only four have ever been discovered, one in the Sierra Nevadas of California, one in the Canaries and in the Balearic Islands, one in Borneo and the fourth which Graham found in Sumatra. For such highly specialized forms this seems to be a remarkable distribution over the earth's surface.

I visited the Villa Paz one afternoon and walked out onto the white terrace where Alexander von Humboldt must often have stood. No wonder he thought the view one of the loveliest in the world; even that from the old monastery of Taormina, with Ætna before one, is not more wonderful. Twelve thousand feet of volcanic slope from the snow cap to the breakers, and then a coast line running for miles away into the distance and at one's feet, three hundred yards below, the surf.

The garden was full of introduced plants, among them a beautiful climbing shrub, *Pithecoctenium muricatum* with evergreen leaves and beautiful yellow flowers; the red-fruited showy *Ficus parcelli;* the West Indian Mahogany (*Swietinia mahogani*) with a trunk fourteen inches through, and what, to me, was a new white-flowered species of Grevillea (*G. hilliana*) that ought to be tried in Florida.

By the end of a week in Teneriffe we had established friendly relations with a future source of seeds and plants and learned that if we wanted to see the most important forage crop species on the islands, we should visit the lesser known island of Palma, which lies a night's cruise to the West of Teneriffe.

CHAPTER XVII

THE ISLAND OF PALMA

Ordinarily the plant hunter who wishes to visit the outlying islands hangs around and puts himself, so to speak, at the beck and call of some "futty" little steamer's captain who runs his uncomfortable boat from one island to the other. Here I was, ostensibly with a boat of my own, for Mr. Armour simply asked me when I would be ready to move on to the next port. I say ostensibly, for, as a matter of fact, time is a terrible slave driver and the choice had always to be made between spending an indefinite period of investigation in one place or taking a look at it and going on to the next. If I were to do the kind of botanical collecting in Teneriffe that would enable me to hold up my head when I talked to extreme systematists like Hutchison or Diels, there would have been no use whatever for the yacht. I might better take a passenger steamer to Santa Cruz and spend the rest of my life there, "and do a piece of thorough scientific work," as they would say. Working with a yacht at one's disposal is an entirely different thing from going alone with a pack on one's back. In the one case you have only yourself to think of; in the other, thirty-odd people take care of you, but they have to be kept busy and the cost of standing still must be considered. This was a yachting expedition to get in touch with out-of-the-way places, and find out as much as possible about what was in them worth bringing into America, so we moved on, and in the morning were anchored in the charming harbor of Santa Cruz di Palma, the port of the Island of Palma.

There is always a delightful freshness in the interest and curiosity with which people look at you if they seldom see strangers, and we had not been in Palma ten minutes without realizing that we were far out of the world, off the beaten track. As we drove up the hairpin turns of the road leading from the harbor to the steep heights that rose above the yacht, and the chauffeur tooted the shrill American siren which announced to the countryside that he was coming, the window shutters opened and wherever there was a pretty girl she seemed to appear, curious to see who the gallant chauffeur had this time. There were few automobiles, and the presence everywhere of fine mules made one realize that in this country the roads are all up and down. From the coast to the Pico de los Muchachos is only 12,000 meters, yet in this distance you rise 2,354 meters, or one meter in every six of distance from the shore. This means that if you want to "go somewhere" you either climb up stairs or drop down them.

The hospitality of a small town toward a pleasure yacht when it arrives for the first time in the harbor is analogous to, though quite different from, the reception of the through train in the old days on the Great Plains. The trick of landing is to land on your feet, figuratively speaking. You must make your contacts with the people who represent the intellectuals and the aristocracy of the town, so that your guides and companions while you stay in the island are the real people there. Mr. Armour did this perfectly. Thirty years spent in landing in hundreds of harbors all over the world had made him a past master in the art of invading a seaport town, and we certainly invaded Santa Cruz di Palma in a way which will not be soon forgotten. There must still remain, I imagine, some mystery in the minds of the citizens as to the real mission of the yacht, even though we did our best to explain, and I tried to demonstrate the fact that we had come to study the wild and cultivated plants of their island.

There is only one good road in Palma, the one that goes to Los Llanos on the Western coast. From the city of Santa Cruz it zigzags upwards until it reaches an altitude of a thousand feet, where it keeps this level, at a distance of a mile or two from the shore, for twenty-five miles. It is an amazing *corniche*. It crosses lava streams so young that nothing is growing on them and one does not need much imagination to see the lava in its fresh state. It passes vineyards in which the grapes are trained on horizontal trellises built like pergolas, but only two feet above the soil, for greater wind protection. There were slopes covered with the young growth of Canary Island pines, and ravines in which magnificent old specimens of it show how glorious the country must have been in the days before Europeans came to its shores. I had seen this splendid Canary pine in arboreta all over the world, for it has been scattered everywhere, but to really appreciate its beauty one must see it in its home, where the young trees look like green lombardy poplars, their slender trunks being covered with short side branches from the ground up.

Señor Alvaro Cutilla Rosa was our host on one of these rides and he took us to his charming *finca*, or country house, to show us his coffee trees, a couple of avocado trees of the Mexican hardy type, and a small collection of northern fruits. The pear does fairly well here, but the varieties seem to have all come from France or Spain; they are not indigenous. To find pears and coffee in the same little garden will give the horticulturists who read these lines a better idea of the cool, moist, but never frosty climate of the island than would any chart. Curiously, although the avocado grows well in Palma, as proved by large trees in the various *fincas* and in the little city square of Los Llanos, no particular significance is attached to it as a possible crop for export from the islands. I suspect too many of the people do not care for it, and it is true that if one does not like a new fruit one cannot very well take an interest in planting an orchard of it. I stood in the little square and looked up into the branches of the avocado tree and thought how strange it is that in California and Florida hundreds should be talking about their avocado orchards and estimating big profits from them, while here in this little mountain town not over a dozen trees had been planted. The terraces where they might be grown were devoted to wheat;

wheat which has to be harvested by hand and brought to market in sacks on the backs of mules, while in the great alluvial regions of the Mississippi valley, where wheat can be produced by machinery at a fraction of what it costs in Palma, farms are being abandoned because the price of wheat is too low.

As we mounted our mules and rode across the lava toward what is known as La Caldera, my amazement at the expenditure of human labor increased, for there, like swallow's nests, thousands of feet above the dry river bed, reached only by zigzag mule trails, were tiny terraces not half an acre in extent, where the farmers were growing wheat and barley.

The Caldera is a gigantic volcanic caldron over whose rim your sure-footed mule climbs, and down into which he steps carefully and gingerly, but never too carefully or gingerly for you who are on him. You do not mind it much when he is climbing and there are rocks between you and the abyss at your side, but when he descends and you can see before you at every step just where you might land below, should his knee fail him, it is nervous work for a novice.

We had been told that we could reach the pit of the Caldera easily by going over its rim and down to the stream bed at its bottom, and following this up until we got there, but we found this more of an undertaking than we had imagined it to be. The boulders were up to the mules' bellies and they stumbled and picked their way up the stream with such increasing difficulty that before we knew it our time had slipped away and we were forced to decide whether to stay all night, for which we were not in the least equipped, or to retrace our steps. When I say that this immense crater or Caldera is over four miles across and 6000 feet deep and that its sides are almost as steep as the roof of a house with sheer precipices of two to three thousand feet and that none of us were mule broken, but quite flabby from the inactivity which yacht and auto travel encourage, I have perhaps explained as well as I can why we did not reach the pit of the extinct Caldera. The vegetation from all accounts must grow remarkably well there, for it is protected from the outside world and lives in a climate peculiar to the Caldera itself. However, I did not learn of any endemic species which occurs there, but nowhere else, in the island.

Upon our return to the port we began to make plans for a trip to the north of the island, and as there were men of the town, notably Señor José Fierro, who had never visited the steep northern slopes of the Gran Caldera, which has an average gradient of one in 3⅞, a party of us, including Wheeler and Graham, decided to go by boat along the coast to San Andres and call on one Don Anacleto Martin, the wealthiest resident of the region, and get him to accompany us up what is known as the Monte de las Lomitas.

The morning was gray and misty, as are so many of the mornings in the islands. The launch was small and the waves were high enough to disturb some of the party. As we steamed along close under the precipitous cliffs the volcanic character of the island was evident, particularly when we passed lava flows whose tough materials had resisted for centuries the action of the waves.

Here and there on the hillsides were old plants, like gigantic candelabra, of the *Euphorbia canarensis*, a plant which, did it grow faster, might some day be cultivated for the more or less elastic gum it contains. Upon approaching San Andres y Sauces, our destination, we passed caves in which were piled hundreds of bunches of bananas, each packed in its little crate ready for shipment by a Fyfe steamer to England. The fruit of this Chinese banana is too delicate to be shipped without being crated.

It was raining when we landed at the mole in San Andres, but the mules were waiting, and after a stop at Don Anacleto Martin's comfortable new house we started up the mountain. Most of the way was between stone walls that shut off the trail from the fields, while higher up the mud holes, worn by the continual passing up and down of the mules, made the route seem more like some irregularly built stairway through the clouds. The poor mule puffed and panted under my weight and before we were nearly up I had to abandon him and, puffing in my turn, lead him up the ditch-like climb.

The tall Canary Island pines were as picturesque as the pines of Japan as they stood out against the clouds in the Barranco de las Aguas.

Stopping for breath at some break in the vegetation which shut me in I could see through rifts in the clouds deep into the Barranco de Las Aguas a thousand feet below me. The great Canary Island pines, which from far down the slope sent their slender trunks shooting up past me, were often silhouetted against the drifting clouds, making scenes rivaling any one sees among the picturesque pines of Japan. When I think of *Pinus canariensis* now, these cloud-backed pines on the Monte de Las Lomitas come into my mind. We climbed up about five thousand feet to where a tunnel had been cut through the mountain and a sluice built, of solid concrete, designed to conduct the waters down into the valley for irrigation purposes. The amount of actual physical muscular energy displayed on the part of men and mules in the building of this skyline tunnel was amazing. It made me think that these people still have a great deal of the same determination that inspired their ancestors to build the terraces, centuries ago, farther down the slopes. Nobody seems afraid of work in these islands. They may procrastinate or have other fatal shortcomings, but they are not afraid of hard physical labor. I saw a boy with an immense heavy wooden plow on his shoulder carrying it with a light step over the mountains from one field to another on trails which would make younger men than I puff merely to navigate. Evidently he thought nothing of it.

I did not find what I had particularly come to see on the Monte de las Lomitas, and that was the native Canary Island arbutus tree (*Arbutus canariensis*). Ever since I first saw that tree in the Botanic Gardens in Naples, I have thought of it as one peculiarly adapted for cultivation in our own Southwest. I do not know how many times attempts have been made to get seeds of it for distribution in California, but for some reason the tree has never become well known in America. It has a bark as soft and delicate as a kid glove, with so little cork over it that with your finger you can scratch a green spot in it. Its fruits are the size of strawberries and have the same brilliant red color that the *Arbutus unedo* fruits have, making the tree a most attractive ornament for parks. Bannerman[1] describes trees that he saw in the Barranco del Rio in Teneriffe which measured 140 inches around.

We lunched with the engineers and workmen who were building the aqueduct at the farthest point of our climb, and as the workmen were eating "gofio," the ancient Guancho food, we ate it too. In the poet Boccaccio's account of the first European expedition to the Islands it is mentioned that "the natives ate their grain like birds, or else made it into flour and ate it with water without kneading," from which I strongly suspect that his attention was called to just what we were seeing there on the mountain, the preparation of "gofio." We are so accustomed to the idea of first grinding our cereals and afterwards cooking them that the reverse way of doing the thing seems strange. The Guanchos first parched their wheat or barley or broad beans over the fire until they were brittle and easily reduced to a meal, then they ground them. This parched meal has a toasted flavor and is perfectly digestible when dry. To prepare it for us to eat the "Chef" put a few cupfuls of it into a goatskin bag, poured in an equal amount of cold water; closed the mouth of the bag with his hand and mixed the meal and water by shaking and pummelling the bag. In a minute the meal had absorbed all of the moisture and become of the consistency of sculptor's clay and he dumped it out in a mass and cut it with a knife into irregular chunks for us to eat. It was very palatable and had a particular flavor of its own somewhat resembling popcorn. I noticed that the workmen preferred this gofio to the supposedly "better" food we were eating out of tins. It is curious to reflect that this extremely simple food should have persisted for so many centuries, long after the modern Spanish cooked foods have made their way into the islands.

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[1] Bannerman, David A., "The Canary Islands, Their History, Natural History and Scenery." Gurney and Jackson, London, 1922, p. 95.

The slide down the ditch-like trail, single file, was less amusing than the climb, for each slip of the mules' hoofs on its muddy sides was certain to attract your attention. It was like driving a narrow mountain road at night in an automobile; one kept his eyes ahead!

José Fierro, we discovered, was the wit of the island and he responded to the call to perform and kept us in roars of laughter. We spent the night at Andres, all of us bunking together in the large room designed for the balls of the village and Don José lived up to his reputation until late into the night. He took a handful of corn to bed with him and just when he thought we were dropping off to sleep, he would let a few grains fall with a rattle on the floor.

In the morning before breakfast, while we were all waiting for our coffee, Señora Martin milked the two fine milch goats in the yard and gave me a discourse on the various goat fodders in use in the island. Since these were the plants I particularly wanted to see I felt that, although the mountain trip had yielded little, I had at least found as good a region as any in which to study the "tagasaste," "gacio," "escoban" and "tedera," four leguminous plants upon which the goats of the islands are fed, and the cattle as well, though in a lesser degree. I was reminded of this morning with the goats three years later when I found in the Plant Introduction Garden in Chico, California, some fine bushes of the tagasaste, gacio and escoban, grown from the seeds we got at San Andres.

Signora Martin milking the gacio-fed goat for our morning coffee.

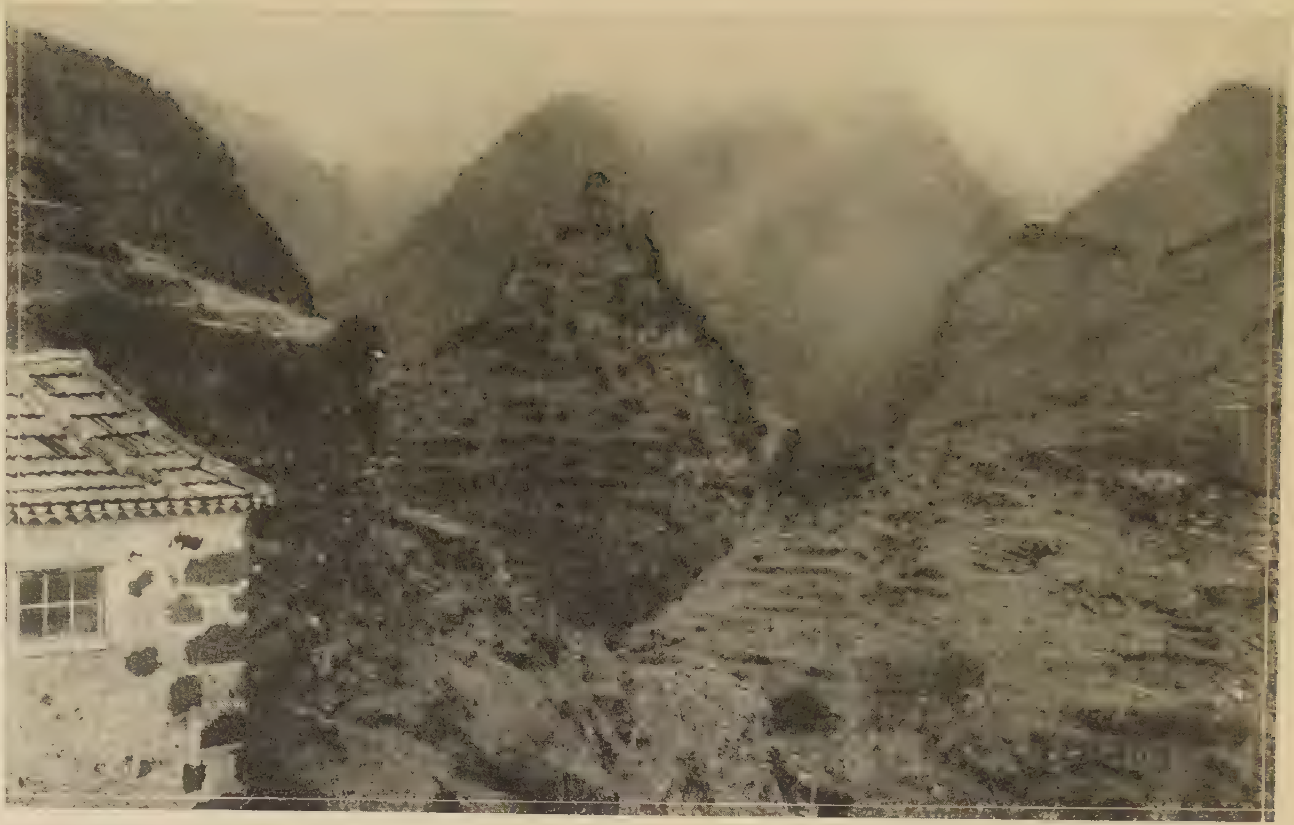
My forage crop region was between San Andres and Vera Cruz, where the yacht lay at anchor. It is not, as the crow flies, more than ten miles, but there are five barrancos between, the trail winds in and out of them and the method of travel is by mule. With a road it would be a quarter of an hour's trip by auto, on a mule it takes a good half-day. The rest of the party chose to return by launch, but since Don Anacleto Martin offered me his own mule, I decided to try for my plants.

When the rest of the party had gone Don Anacleto Martin had his man Hernandez bring up the mule. He boasted that it was the prize winner of all the mules on the island, and I could see by the delight in his eyes that he was more fond of it than a boy is of his first bicycle. He saw a few unruly hairs in its mane, which he didn't like, so he ordered a pair of scissors, and with his own hands trimmed its mane while the family looked on with great interest.

His trusted muleteer, a very intelligent fellow, accompanied me and we set off in the mists for Santa Cruz. We rode down into the barrancos and up out of them again without finding even a trickle of water in the dry river bed of a single one of them. We wandered in and out of the tiny terraced fields on which were growing corn and lupins and cabbages and onions in that rather irregular rotation practiced in climates like this, where summer and winter are not sharply defined. The Barranco de la Galga I shall never forget. The rain clouds hung over its terraced peaks and yet I could see up its dim valley. There was something sinister about the death-like stillness hanging over it and I found it easy to imagine it filled with those dragons and gnomes and fairies and giants with which primitive man has been wont to invest the mountains of the world. Go where you will, in all lands, the mountains have been the abodes of spirits unfriendly to humans. Even the Alps were, until comparatively recent times, fearful places for the peoples of the plains.

In the moisture prevailing in these barrancos the Canary Island pines behave strangely. They look for all the world like evergreen poplars and their trunks are clothed with short branches clear down to their bases.

Anyone who loves the irregularity and delicate coloring of a rock garden would find a peculiar delight in a barranco. I never realized what one could do with such a place until last summer when in British Columbia I visited the famous garden which Mr. and Mrs. R. P. Bucharts have made out of an abandoned cement quarry at Tod Inlet, on their place near Puget Sound. With



The Barranco de la Galga. The mysterious peaks and precipitous terraced slopes covered with clouds are characteristic of the Canary Island landscapes.

water and fertilizer one could make a dream of beauty out of a barranco.

At last we came to cultivated areas of the tagasaste (*Cytisus proliferus* var. *palmensis*), a leguminous shrub indigenous to this island and one that has been cultivated for two thousand years. According to the late Dr. Jorge V. Perez, Columella, a celebrated Roman agronomist, wrote of this genus of plants a half-century before Christ, indicating that it was grown as forage at that time. Our agriculture being on a more machine basis than that of other countries, there has hitherto been little interest in such plants as this tagasaste, but with the opening up of areas in California and possibly Arizona, this plant, as well as its relatives, may find a permanent home, and through their drouth-resisting qualities and the nutritious character of their succulent twigs, furnish the herds of sheep and goats of the region with more forage than they can get now from the native plants.

We passed one of these plantings that was only a few years old and watched the farmer with his sickle cutting forage for his goats. He explained to me that the tagasaste forms a trunk several inches through, becomes a small tree in fact, and unless it is cut back to a height of a meter above the ground it does not produce the tender shoots on which the goats feed. These shoots should be taken off two or three times a year if the full worth of the plant is to be secured. His plantation was a piece of steep stony mountain side, and when I saw the amount of forage tagasaste produced I could well understand the man's enthusiasm for it. I doubt very much if he could find any other leguminous plant which would yield more for the effort he put into it than this tagasaste.

The "gacio" or "gacia" as it is variously spelled (*Cytisus stenopetalus* var. *sericea,* Pittard), resembles the tagasaste, but has yellow instead of white flowers, while the "escoban," still another of the Cytissi, has been recently determined by Mr. Hutchison as a new species and he has dedicated it to Dr. Perez

(*Cytissus Perezii*). Pittard calls this *C. proliferous* var. *canariæ*, Christ. Since all of these species, and others which occur at even higher altitudes, extend up into the cloud-belt zone of the islands from 2000 to 3000 feet altitude, they may prove on extensive trial to have their best development on the coastal areas of California rather than in the interior.

On the terraces much lower down, which at this season of the year were rather weedy-looking places, the goats were feeding on a leguminous plant called "tadera" (*Psoralia bituminosa*). An interesting thing about this plant to me was that it seemed to be waging a quite successful war on the Spanish Needle, a species common in Florida (*Bidens leucantha*). We badly need some useful leguminous plant to compete with this robber which steals all the fertilizer we put around our plants and ruins the ladies' silk stockings with its sharp seeds. I found an old man of over eighty who had spent almost his whole life here on these terraces, and I visited his little farmhouse and saw the pile of dry tadera he was about to store in the stone barn adjoining. He was enthusiastic about his tadera. It was a very valuable fodder for his milch goats and sheep, fed either dry or fresh. It is a practice, he told me, to scatter the seeds of the tadera everywhere along the mountain trails, where the goats can get the herbage as they range.

The clouds were gathering in the barrancos and it was getting dark, so, although I should have loved to stop longer and hear from the old man of the mountain about his philosophy and his agriculture, I had to move on down the hillside. It is amazing how many events one can pile into a mountain ride through the barrancos of the Canaries. There seems to be reflected in every book I have read on the Islands something of the romantic character of the life here. Isolated, quiet, frugal, simple, and honest, are words that might be applied to it, I should think.

As for the tadera, I arranged to get the seeds and they are being experimented with in our Southern States. As there are more than a hundred species of this genus scattered over the world, some one somewhere may find them capable of hybridization and improvement. Who knows?

Of the festivities on board the yacht, of the swinging of the Utowana's stern too near to the shore, of the scaling match of the crew who wagered with each other that they could climb the seemingly perpendicular wall of the harbor to the heights above, I must leave the recounting to Mr. Armour when he gets his hearers around his balanced dining table on the Utowana.

Of one incident I do wish, however, to make a printed record. It relates to a new and most ingenious discovery of my friend Jordan Mott. He accompanied us one morning to the top of a promontory overlooking the harbor, and there, because his breath gave out, we had to leave him while we climbed on higher. There were quantities of medicago burs scattered in the short dry grasses on the promontory and he knew they were a particular hobby of mine. When we had gone some distance up the slope we looked back and there was Mr. Mott rolling in the grass, for what reason nobody could surmise. When we returned he handed me a large handful of the burs of the medicago. I was amazed at the number he had been able to pick and at the same time curious to know why in the world he had been rolling around on the ground. He called attention to the rough tweed suit he was wearing, to which some of the medicago burs were still clinging and explained that he simply rolled among the burs and then scraped them off his clothes. Had he ever been on the tea estates of the Orient, where the finest Orange Pekoe tea is collected by laying a rough woolen cloth on the dried tea leaves, where it picks up only the very youngest of the buds which are covered with golden hairs, I should have accused him of merely adapting a tea planter's trick, but since he had never set foot in the Orient the discovery is his own, and some day he deserves a medal, but I don't know just how he is going to get one.

CHAPTER XVIII

GRAND CANARY AND LANZAROTE

JULY 21st found us in Las Palmas on the Island of Grand Canary, the metropolis of the archipelago, where Mr. Lathrop and I had stopped on our way up from South Africa in May, 1903. I was interested to see what a quarter of a century had done to this little island in the Atlantic.

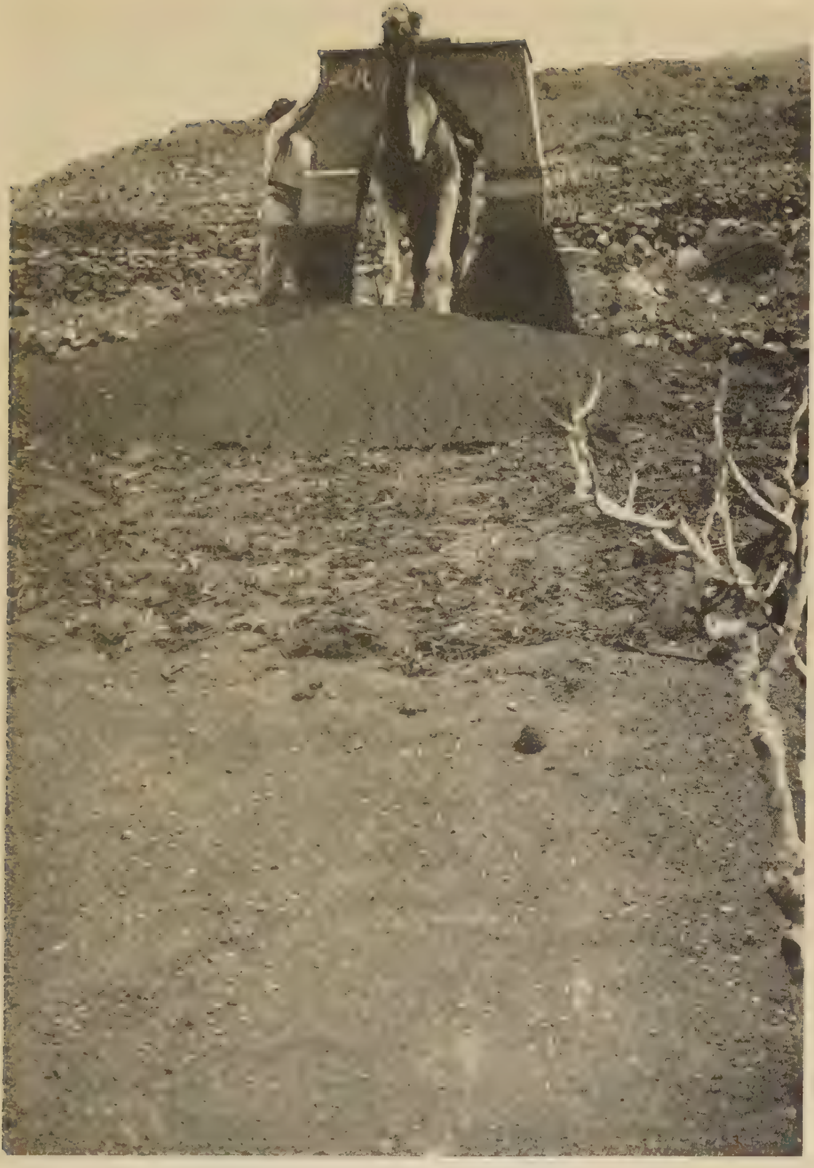
The town itself I found much changed, and less beautiful than it had appeared to me twenty-five years before. There was at that time a very charming subtropical garden in the town surrounding a tourist hotel, "The Sta Brigida," but since the hotel had failed, the garden had been neglected and there were only fragments of a previous beauty to be seen. It is always thus when the maintenance of a collection of trees has to follow the vicissitudes of hotel fortune. South Florida offers innumerable examples of this truism.

No sooner had we landed and gotten in touch with my old acquaintances the Blandys, who for a generation have been the important British merchants of the place, than questions began to pour in on Wheeler about the Argentine ant and its relations to the banana scale. The effects of the spreading of the scale by the ant are alarming and I do not wonder that the most strenuous and effective methods of control are advised. Whether there is enough coöperation, or whether a high degree of education with regard to the destruction of the ant can be arrived at remains to be seen. It is certain that the Argentine ant offers a splendid example of the fact that the struggle of mankind is not altogether with the large animals or with his own kind on this planet, but quite as much with the smallest and most insignificant creatures that share it with him.

Grand Canary is the island of the group whose vegetation has suffered most from forest destruction, but I was told there still remained a fragment of the original forest cover at Moya, in what is known as the Til Forest of Doramas, so we went there to see if by chance we could get seeds of the famous til tree, *Oreodaphne fœtans.* Although the hills around Las Palmas were dry and parched, as soon as we reached the region of Doramas we found ourselves in a dense evergreen forest, now reduced to a small area but which at one time is said to have covered great stretches of the mountain side. The til trees were in fruit and we spent the afternoon gathering seeds. They were typical short-lived seeds and as soon as I saw them I knew we would have difficulty in getting them back to America alive, and we did. They were packed in various ways with great care, but for some reason never survived the voyage. We had not at that time developed the special technique that enabled us later to send such seeds successfully. The til tree will, I predict, be always a bit difficult to grow anywhere on American soil because of its need for a frostless but cool and perpetually moist climate, which is one of the few types of climate the geographic boundaries of the United States do not appear to include.

Don Juan Bolinaga had told us of the vine culture on the island of Lanzarote, and his description of the conditions there made me particularly keen to see it. I am glad we did, for the glimpse of that cloud-drenched, rainless, volcanic island will always remain as the most vivid of my Canary Island impressions.

I knew it was a dry island, but I had no idea that we were to visit a place where it had not rained for two years. I was reminded of Mr. Lathrop's beloved Paita on the coast of Peru. After we had been traveling for two or three years, during which he had often teased me with the remark that some day he would take me where there would not be a blessed thing to collect, we found ourselves on a steamer off the West coast of South America,



Unloading the wooden saddle-bags which brought several hundred pounds of volcanic lapilli to be spread as a thick mulch over the manure already laid down on the clay soil of Lanzarote.

and he said "Now, Fairy, I will be able to show you Paita." We came into the roadstead so early that before I knew it I heard Mr. Lathrop hammering on my door. "Get up, Fairy, the blooming place is as green as an English landscape, I don't know what has gotten into it." We had arrived just a week after the first rainfall in eight years! Every seed that had been blown in there and remained dormant, and every seed left by the vegetation following the last rain, had sprouted, and the result was a greensward, or so it seemed from the ship. When we got on shore we found that the blades of grass were two or three feet apart. The ten or twelve species of flowering plants were already maturing their seeds, although they were not over two inches high. One could easily imagine that the plants knew there would not be another rain for years and were going to produce seed at all hazards.

Lanzarote, however, has a great advantage over Paita, and although Bannerman describes it as one of the "barren outliers of the Sahara," [1] it is by no means a desert island, for every night a cool cloud cap settles on its volcanic peaks, depositing its moisture on the porus volcanic cinders below.

When Wheeler came on deck that July morning and saw the prospect that the port of Arrecife afforded, he was ready to go back below, for of all black, forbidding coasts Lanzarote furnishes the worst. We scanned the rocks with our glasses and could not see a single plant where a living insect might make its home. It seemed hardly worth while going ashore. In the face of things I think I wagered Wheeler that it would prove the most exciting place we had yet visited.

We got off in the starboard launch, making our way through shoals on which the launch later stranded. We asked for the residence of Don Raphaelo Hernandez, the rich man of the town, and called upon him with our letters from Don Juan. He received us with great courtesy and we explained to him in broken Spanish the object of the visit of the white yacht, with the result that he accompanied us to Haria, a dozen miles to the north.

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[1] Bannerman lc. p. 48.

The valley of Haria is terraced with wonderful walls of lava rock often ten feet high, and as one sees it from the turn in the road, with here and there a single Canary Island date palm (*Phœnix canariensis*) rising fifty feet into the air from some courtyard, it presents an attractive appearance. The interest deepens as one sees that some of the hillsides are almost black while others are ashen gray, and notices that the black patches are in squares like cultivated fields. The explanation was soon forthcoming, for up the steep road came a camel with curious box-like saddlebags fitted to his back. I followed him to the field to see what was happening. The camel driver pulled a string and from the boxes on either side a stream of lapilli or broken, porous fragments of volcanic material poured out, making a mound on each side of him. These mounds were later leveled down until they formed a layer of the lapilli six inches or so deep. This is a remarkable mulch for these peculiar conditions as it not only retains the small amount of moisture left in the clay soil from the last rains, which occurred two years ago in this instance, but it also collects in its innumerable cavities the minute drops of cloud mist with which the land is swept nearly every night. So long as the mulch does not become mixed with dirt it seems to collect this moisture, and this is the reason why the Lanzarotian peasant does not pull up his weeds, but cuts them off in the mulch. He is afraid of pulling soil up through the mulch to its higher strata. So fine are the pores in this lapilli, and so firm is the texture of the material that it was all I could do to resist bringing away a few tons of it to use on the potting benches in our greenhouses. I have since regretted not bringing a sample large enough to test in comparison with the ordinary coal ashes.

Señor Hernandez took us to one of his estates where, to my surprise, I saw growing in the pure volcanic ash, a considerable variety of ornamental plants. Over the wall climbed a night-blooming cereus, beside it was a pelargonium in bloom, and near this a tree of the temple flower, or frangipani, all growing without a drop of rain in two years.

A few miles farther on, as we drove through Uga, I saw some ten feet below the roadway, on a terrace of loose gray ashes, a field of dwarf corn. The stalks were not over two feet high and on them the ears were nearly full grown. It was such an interesting sight that I hurried out, camera in hand, to inspect it. I had not counted on the peculiar roughness of the volcanic rocks composing the road bank, and before I knew it I was sprawling in the ashes among the corn. One does not fall as skilfully after fifty as one does at twenty-five, but I escaped injury, and strangely enough the camera did too. I think this corn is what my friend Guy Collins would call a true brachytic dwarf, such as has appeared in his breeding experiments, and is not simply the result of the rainless environment. It appeared very different from the stunted corn I saw on Grand Canary, which was evidently starved for want of water.

It illustrates, I think, a very interesting principle in Genetics and one having a wide application. This particular dwarf variety originated through some mutation of the genes in a single sex cell of a normal corn seed. An individual plant was produced having its joints close together instead of a foot or more apart, and, being the result of a mutation, this character was inherited. The progeny from this first dwarf individual were self-pollinated, with the result that many of the seeds produced dwarf plants, and so, without any evident effect of the environment, there came into existence a variety of brachytic dwarf maize. That it also stands drouth better than other varieties is doubtless the reason it has persisted, and this characteristic would also lead to its being planted by the farmers. In other words it is a mutation which happened to be adapted to its waterless environment, but it was not caused by that environment. A plant breeder might have produced the

A true dwarf maize growing in the volcanic ash of Lanzarote and taking as long to become two feet tall as that in Kansas does to grow twelve feet high.

dwarf in a garden in Maryland and sent it over here with the same result.

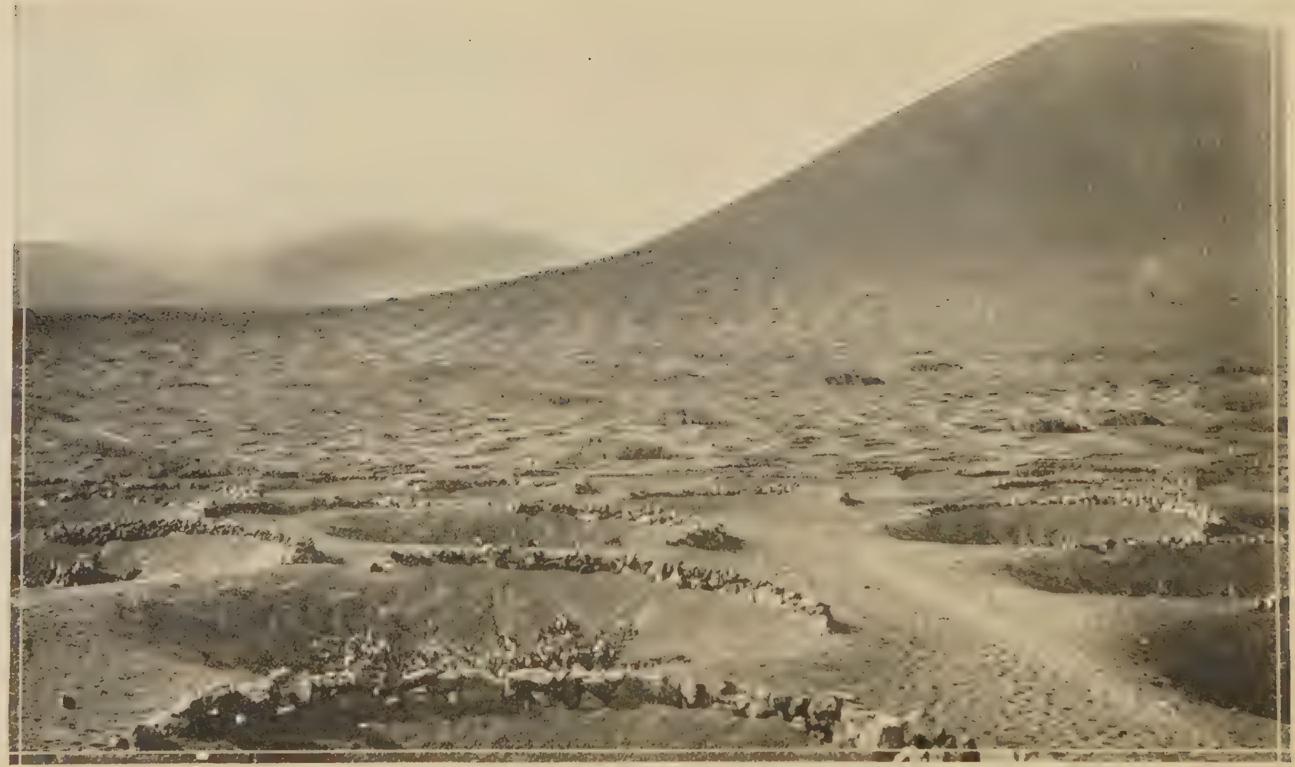
To one who remembers being lost in a Kansas corn field as a boy, it was a very curious sensation to stoop and brush away the ashes and pick the ears of this strange pigmy corn. At first one might conclude that being so small this corn would mature rapidly, but this is not the case. It takes it just as long to mature its single ear as an eighteen-foot stalk does to produce four ears in the "Kaw" Valley of Kansas.

Why should these desperately poor farmers be growing such a corn here, while the farmers in the rich bottom lands of Arkansas, where corn ten times as large and productive can be grown, are unable to make a profit? If these Canary Island farmers could only grow something which the Kansas farmers wanted, and the way were open for a free exchange, both might be better off.

In so rainless a land special appliances have had to be erected for the catching of every drop of rain water and its storage in cisterns, some of the catch basins of cement covering half an acre in extent. At the time of our visit water was being hauled across the mountains on camel back from cisterns better supplied with water than those on this side of the island, which were exhausted. Sometimes the water shortage is so great that shiploads of it have to be brought from Fuertaventura, the neighboring island. My father-in-law, Mr. Graham Bell, would have been excited to visit this island where there was "water, water everywhere and not a drop to drink," for his last invention was a simple distilling apparatus worked by the sun, an air-tight tank with a sloping glass roof down which the moisture rolled on the inside, as it does from a greenhouse roof, to be caught in a bottle below. Salt water, as well as any other, can be distilled in this way. I am using one of his sun stills for my laboratory on the Bras d'Or Lakes of Nova Scotia. Thinking Señor Hernandez might erect one on his beach, I described its manufacture to him and he seemed much interested.

If the north end of Lanzarote is interesting, the south end is exciting. There are the Montañas de Fuego, volcanoes which were active as recently as 1733 and which at that time threw up such enormous quantities of scoria, or volcanic ash, as to cover the landscape completely. Wheeler and I went there first. We had read the guide book and the floras of the place but were neither of us prepared to find ourselves suddenly, with no more ceremony than is involved in turning the corner of the road, thrown into a landscape rivaling any ever pictured by Gustave Doré. Can you imagine a black landscape? Can you imagine little whitewashed farmhouses standing on the very brink of a great black lava flow, with its sharp black rocks everywhere about in the backyard? I could think of nothing like it except the dump from some great furnace in Pittsburgh with the surrounding shacks where the unfortunate workers live. But these were farmhouses. Some distance away the owners had their little terraces covered with scoria, or lapilli, and on them grew beans and corn and tomatoes and onions.

The forbidding black landscape, the wind that blows continuously, the chill clouds that drift in every night, all combined to give me a shiver which, although three years have now elapsed, I can still feel in my imagination. To know that with all the vast open spaces of the New World uninhabited, human beings should have hung on here through the centuries which have passed since the discovery of America, ought to make us pause in our generalizations about the overcrowding of the world. The Canaries were a port of call of Columbus and it is said that he picked up horses on the islands and took them with him to America, and that from some of these the mustangs of our Southwest originated. Down through the centuries these people could not have remained ignorant of the existence of the New World. Why did they, each



"The cinder pits of Hell." A vineyard on the black ash cone of the Volcan de Fuogo in Lanzarote, where the dews and clouds collecting in these pits form the only source of moisture.

generation of them, stay in Lanzarote? Why do coveys of quail remain in the Dakotas in the freezing blizzards when they have wings to take them elsewhere? Is it because they like it where they are. Is that all?

As we drove farther South the prospect became more weird and more desolate. At last we came to a huge black plain stretching away up the slopes of an almost extinct volcano, and as far as the eye could reach there were great pits in regular checkerboard formation. These pits were excavated six feet deep and twice that width in the almost black, coarse, cinder gravel, and in the bottom of each there stood a grapevine, its branches brushing the sides. Incredible as it seemed, we were in a vineyard! The sun was low, the shadow of each pit was deepest black and the whole scene had a fascination which was hard to explain. We watched two men walking on the narrow pathway fringing the cinder-like depressions, and as they disappeared in the distance they seemed to Wheeler and me to be tending their vines in the cinder pits of Hell.

We tarried for some time examining the pits and watching the gathering clouds that would soon blanket each of these pits with mist from which the porous rock fragments would gather a certain amount of moisture, which, trickling down into the soil, would prevent the vines suffering for lack of water. Some of the finest grapes in the Archipelago are said to be those grown here and I regret that they were not ripe so that I could extol their good qualities, for such labor as this culture entails deserves to be extolled.[1] Some day I want to return and make a closer study of this region.

The day was waning and there was one plant I wanted very much to get seeds of. I had read in Pitard's Flora of the Islands that in Lanzarote there was a cultivated species of retama peculiar to the Canary Islands (*R. rhodorrhizoides*, Webb et Berth) that grew into bushes three to four meters high. Señor Hernandez knew of a bush in a private yard at Yaiza, the end of the motor road. It was almost dusk when we got there and I had difficulty in getting a photograph of it. Some children were playing under the bush and I engaged them to gather all of the seeds they could find, enough at any rate, to make a trial of this sand binding shrub in America. May its fragrant white blooms some day fill the air of the sand dunes of California!

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[1] Samler Brown says as many as 100 gallons of wine are sometimes made from the grapes from a single vine.

Around the yacht's delightful table Wheeler and I discoursed of the cinder pits of Hell and so aroused the interest of Mr. Armour that although the weather looked threatening he offered to make a visit to them the following day to try to get some good photographs.

We wanted the afternoon light so we started about four, Don Raphaelo taking us again in his car. By this time the wind had come up and as the car struck out across the sandy coast, it rose to a gale, blowing the fine dirt and sand in our faces with a cutting blast. We were traveling through a sand dune, one of the shifting ones where the sand travels rapidly across the landscape and soon the car began to slow down and it became a question of whether or not it could get through. It did, however, and we reached the pits just as the sun was sinking behind the clouds. There was barely time enough to make a few exposures before the wind, which had been whistling about our faces all the way across, rose to a point where photographic work was out of the question and I began to wonder about that shifting sand dune we had found difficulty in coming through on the way out. Had it become so deep that we could not cross? We found it had indeed become much deeper and there was nothing for it but for all of us to get out and push. The fine dust turned to mud on our moist faces as we pushed and shoved, and by the time we got it through we were covered with a layer as thick as a piece of blotting paper and as smoothly laid on as a calsominer would have done the job.

As a fitting end to this adventurous afternoon we saw, as we came in sight of the harbor that the Utowana was dragging her anchor and the starboard launch was aground on a shoal. Our host and his friends came on board the yacht for a short call but as soon as the maimed launch had been rescued we hoisted anchor and steamed away from Lanzarote for Gibraltar, bound for the next nearest archipelago, that of the Balearic Islands off the Southeast coast of Spain.

CHAPTER XIX

THE BALEARIC ISLANDS

A FOUR days' run through a summer sea brought us back to Gibraltar where we were impressed by the glare and heat of the Mediterranean after the cool insular climate in which we had been basking. The time on the boat was all too short in which to sort out our collections, clean our seeds, pack them for shipment to Washington, and prepare for the next collecting ground.

There is something curiously vibratory and mentally upsetting about the throb of a propeller and the continually changing levels of horizon which are associated with even a good-sized boat like the Utowana. Freedom from shore annoyances and visits and all that, do not give leisure, for the sea itself is a restless medium. The days pass swiftly and before you have really settled down you have to prepare for landing somewhere else. No, I fear there is some illusion about the quiet of a sea voyage if you try to work much with your brain.

Then there was another difficulty which still further shortened our working hours, if it could be called a difficulty. The meal times were too exciting, for those were no ordinary personalities which gathered about the table. There was Mrs. Jordan Mott with her lifelong familiarity with British political and society life, her keen interest in everything relating to Napoleon and her unfailing belief in the value of the expedition, combined with her religious spiritualism, to which Jordan Mott added a long association in New York business affairs and a never failing fund of stories and good humor. Wheeler with his wide experience of the whole zoölogical world, as well as the world of insects, his keen sense of humor, and his vast stores of philosophical and scientific knowledge was always ready for a discussion, and then there was our host himself, Mr. Armour, who knew the courts of Europe and the yachting circles of both continents. He had conducted two expeditions to Yucatan in the interest of botany and anthropology and had played a part in rescuing the ruins of Chitzen Itza, now under the protection of the Carnegie Institution. He had conducted an archæological survey of Crete and the Eastern Mediterranean for the School of Classical Studies in Rome; also assisted at the excavations undertaken by the Archæological Institute of America on the site of Ancient Cyrene in Tripoli, unfortunately interrupted by the Italian-Turkish war in 1912. Was it any wonder that we often lingered around the table, oblivious of the half-dried seeds in the laboratory below?

However, we managed to get a good shipment of seeds off to Washington from Gibraltar, and pushed on to Iviza, where we arrived on the thirteenth of August. We came on deck in pajamas, as usual, to see the picturesque shore, lined with white houses and backed by a cathedral on the hill behind it. We were in the Balearic Islands, about which Dr. Trabut had always been so enthusiastic. Here were the Islanders, who although of the same blood as those of the mainland of Spain, are so different, and here were we, fresh from the Spanish Peninsula, ready to observe those differences.

As we landed in the early morning and strolled to the neat roofed-in marketplace we began to feel that we had landed on a peculiarly friendly island. The manners of the people as shown in their anxiety to give back the change when one bought anything, and the fixed prices that seemed to prevail among the cab drivers, struck us at once, in contrast with the behavior of the men of similar social scale in Spain. How much of this is due to the absence of tourists and how much to the fact that in an island community it often seems possible for the better elements to keep a stronger control, I do not know. It is also possible that in these islands, visited since the times of the early Cretans, by venturesome mariners of many different races, a type has come into existence quite unlike that of the mainland of Spain and that to this fact rather than to the insular position of the country may be due the difference so observable in the people. It is impossible to tell.

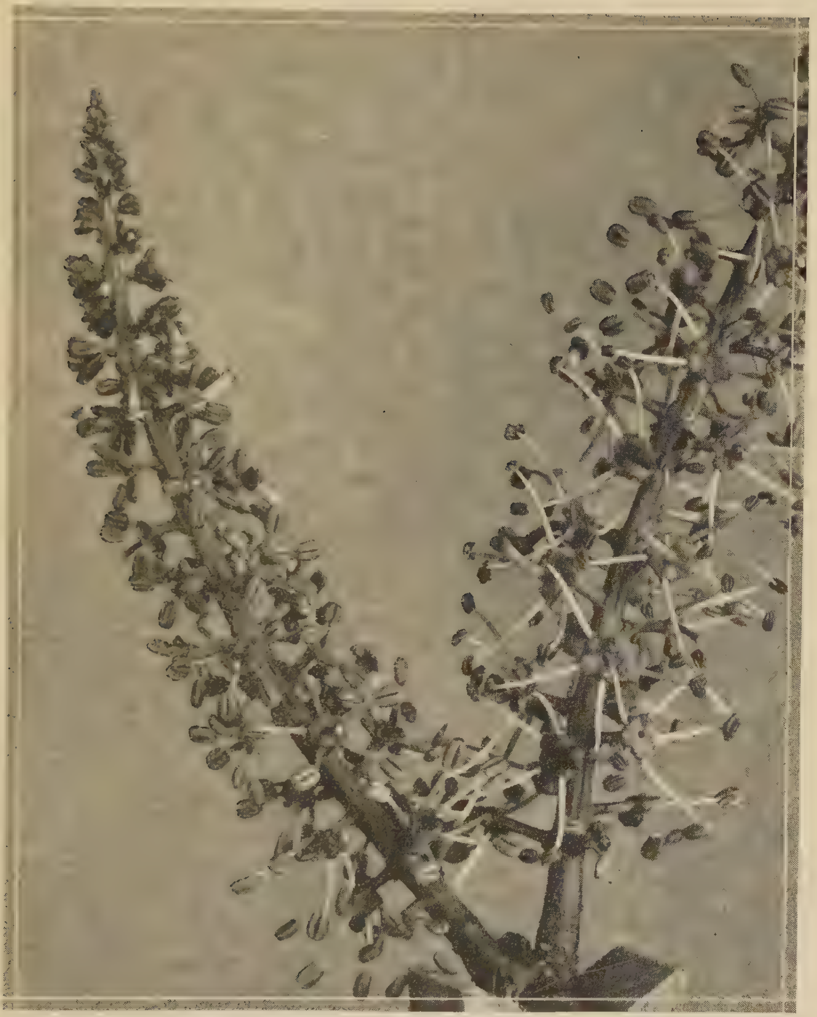
It was melon time in Iviza and as Mr. Armour and I walked into the marketplace we found the characteristic Iviza melons in piles all over the floor. During our stay in Paris we had found some delicious winter melons of Spain in a little fruit shop near our hotel, and here in Iviza were the same types of melons, as well as many others. The mixture was bizarre, and so to our eyes was the way of hanging them to the ceiling in individual open meshed bags to ripen. The melons were all oblong, sparsely netted types of the cassaba race, which seems to be very common in the Mediterranean region. One of them was wrinkled like the California cassaba melons, but the rest were smooth. I bought half a dozen types and took them aboard, imitating the manner of suspending them to the ceiling and watched to see which of them would keep longest. The smooth dark green-skinned types ripened some time in August and the wrinkled one was still hard on the 17th of November. Since the cucurbits are, of all vegetables, the most open in their methods of pollination there is never any way to tell what the progeny will be from even the finest melon you may find in some foreign market. Since seeing Dr. J. B. Norton's immense fields of melons in the Imperial Valley and noticing how carefully he was breeding them to get a type that would be uniformly sweet, mildew resistant and that would ship to New York as safely almost, as a grapefruit, I realize how far behind in the technique of melon production little Iviza has remained. I don't suppose a single one of the growers has any idea of the laws of inheritance, worked out by Gregor Mendel, the monk, in his garden of peas near Brünn. If he did, perhaps he would find a way to standardize and make more uniform the melons of Iviza. Some of the seeds I collected in the market were sent to Norton and who knows but that he may find

The giant onion of Iviza, six inches across—a delicate salad vegetable.

a character in one of them which will form a part of the ideal variety he is attempting to produce? It is true I have never tasted a sweeter melon than one which Mr. Armour found in Iviza, but the trouble would be to find another one just like it.

Among a lot of these melons we saw a basketful of the biggest onions I ever saw in my life. One of the largest measured six inches across. It was flat like a turnip, and brilliantly white. It was so large that the bashful little boy whom I tried to photograph as he was carrying one home was able to hide his face behind it. We took one to the yacht where the chef boiled it and served it as a salad with a French dressing. It was large enough for the party of nine and everybody declared it to be a most delicate vegetable, mild in flavor and excellent in texture. I wish I could buy such onions in America. I wanted very much to see their culture as I was told that the sets are put out in the spring and later transplanted a second time, but the season was over and I could not see this practice.

In 1901 I had spent some days on the Southeast coast of Spain and while there, had been much interested in the orchards of algarrobas with which the plains about Alicante were planted. I had sent in a collection of the varieties of this interesting forage tree and we had propagated them in California where there are now many large trees, fruiting well. It is the *Ceratonia siliqua* of botanists and it carries the Biblical name of St. John's Bread or carob in English, carrubo in Italian, and algarroba in Spanish. It forms one of the most picturesque trees with which the limestone cliffs of the Mediterranean are dotted, since it grows to a very old age, is evergreen, and has a peculiarly picturesque shape. Like the date palm and the hemp plant, the tree ordinarily bears only male or only female flowers, thus making it necessary in the planting of an orchard to set out both kinds of trees, but, as the bees are very busy workers and fly from tree to tree, one male for a hundred female trees is sometimes enough. While in Spain I had found one variety that produced hermaphrodite flowers, that



There is a good deal of variation in the hermaphrodite flowers of the Iviza carob, and not all of the flowers have pistils. The uppermost right-hand flower is hermaphrodite.

is to say it had both fertile female flowers and pollen-bearing male ones on the same fruit cluster. I had sent scions of this to America and also to Algiers to Dr. Trabut who told me that he had distributed this variety all over Algiers.

With this experience behind me, I determined to see if in the Balearic Islands there might not be another hermaphrodite variety and, as the trees were in full bloom, I set out one day to find one. I went alone, taking along my field microscope, for it is necessary to examine deeply into the anatomy of the carob flower to be sure that its male flowers produce good pollen. I shall long remember that quiet day with the growers of carobs in Iviza. I gathered the flowers, and camping down in a near-by house where I was offered a chair and a low table, with a group of curious but interested people around me, I worked out the sex relations of the varieties of carob in the Island. One of them is bisexual or hermaphrodite and this seemed to be one of the most productive of them all and the favorite. It is called the "Panesca." Whether this variety will be as productive in Southern California as some of those I sent in many years ago from Spain, remains to be seen. There is a slowly growing interest in the carob in California, the only part of the United States where it grows well.

The almonds of Spain have always been noted. The famous Jordan with its characteristic long, narrow kernel, which the confectioners prefer to all others for coating with sugar, I had once traced to its center of production in the Sierras of Southeastern Spain. I had secured scions of this variety and from these many trees had been grown in California, but alas! the climate or the soil, perhaps some combination of conditions, has prevented the production of a Jordan almond as thin skinned and tender as the almonds of this variety which come from the dry dusty hillsides of Southeastern Spain. There is something strangely classic about the almond. I do not know that it has been cultivated any longer than some of the other fruiting trees that form our orchards, but

Pods of the Panesca carob of Iviza, a hermaphrodite variety and a heavy bearer.

in some way it has woven its delicate branches covered with pink blossoms, into the poetry of the most ancient peoples as far back as there is any record. Its origin is obscured by the dimness of over four thousand years of culture. Its unmistakable likeness is found in the mosaics of Pompeii, references to it occur in Pliny and Virgil and in the Book of Genesis, and its flowers are found on the ancient vases of China. What spring landscape in the Mediterranean would be complete without this superb flowering tree, and how much the autumn there would be impoverished if the almond gatherers were taken out of the picture.

The fruits of the almond were just opening in Iviza, and beneath their peach-like fuzzy shells the clean brown almonds themselves were showing. I recall with keen delight the summer days in Iviza which Graham and I spent with some intelligent almond growers around San Antonio, with Rafael Francisco Mari as guide.

Dr. Trabut had given me, before I left Algiers, a copy of "El Almendro" by Pedro Estelrich [1] but in the whirl of other interests, I had not found time to brush up on almonds and I was forced into the orchards without being as well posted as I might have been. In rapid travel this situation is always likely to happen, it has haunted me all my life, but I have never worked out a solution. I have always had to push on. In this truly remarkable little book I find a poetic quotation from D. Gaspar Melchor de Jovellanos who published a work on Majorca in 1889, and I cannot resist repeating it here in the Spanish. It would lose all its beauty in a translation.

> Y apenas los sembrados empiezan a tender sobre campos y llanuras su rica vestidura, cuando el almendro, interrumpiendo el sueño de la naturaleza, asoma atrevido a desafiar al diciembre; remeda a los lejos sus nieves, cubriendose de blanquisimos copas de flores, adorna de cerca con un numero increible de grandes y espesos ramilletes la hermosa y variada campiña; y jugando, por decirlo asi, con el orden de las estaciones, brilla y campea sobre ella anunciando por todas partes la madrugada de la primavera.

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[1] Estelrich, Pedro, "El Almendro y su cultivo en el mediodia de Espana e islas Baleares." Madrid Jijos de J. Cuesta. Imp de B. Rotger, 1907.

I found what at first seemed a bewildering number of different varieties and at first suspected I was looking at a lot of seedlings. Estelrich collected nearly four hundred varieties of almonds in Majorca, and while there he admonished the growers to follow the example of the Spanish growers in Tarragona where only three are cultivated, or of Alicante where ten are grown, or of Andalusia where only the Malaguena, probably the Jordan of commerce, is extensively cultivated.

Nothing is more characteristic of the orchards of Europe as compared with those of America than the multitude of varieties in the one and the small number in the other. I remember once in a little town in Bavaria being taken into an orchardist's cellar and shown more varieties of pears than I knew existed, and when I expressed delight at seeing so many, the owner explained that it was the curse of orcharding in Germany that they had so many kinds of fruits that they could not standardize them and market them as we did in America.

I was struck with the looks of three varieties of almonds in Iviza, the "fita mollar," the "mollar grande," and a variety which, although it was called the "pau" bears little resemblance to that variety as described by Estelrich (page 37, l.c.), and which I suspect is really the Malaguena of Almeria, my old friend of the Sierras of Southeastern Spain. Whether any of these will prove better than the varieties already growing in California remains to be seen. I did not have an opportunity to get the "Lluch" which Estelrich describes as a late flowering variety; the "Progresso" with a very light but hard shell and which is an unusually heavy bearer; the "De la Canal" which resists unusually low temperatures; and others whose characters are more indefinite but are all recommended by him. None of these seem to be grown extensively in the islands. Some one who has a more technical knowledge of the almond industry than I have should look up these varieties.

The next day being Sunday we went ashore, particularly to see the betrothed, who carry on their tête-à-têtes in the doorways and on the streets in a manner which for modesty and good breeding would put to shame the petting parties our highways are spattered with. Dressed in their Sunday best they stand in couples everywhere and pretend to be, if they are not really, quite oblivious of all that is going on around them. I raised my camera at two of the young ladies in their gold chains and other finery but they promptly put their fans before their faces. Then I learned that when once betrothed it is not proper for a girl to be photographed by a stranger. The whole behavior of these couples was as restrained as was that of the co-eds in the early days of co-education in the Middle West, when instead of dances we had so-called "sociables."

It is only eighty miles or so from Iviza to Palma, the port of the Island of Majorca, and the yacht made it in a night's run. Palma seemed a metropolis with its large hotels, broad streets and plazas, and one feels as though one were coming back to civilization on arriving there from Iviza.

We had no more than landed when Mr. Armour discovered a most interesting guide in the person of the doctor of the port, Dr. José Porcel, who was trying for the Rockefeller Scholarship, and we were soon off to Soller, botanizing and entomologizing wherever the collecting looked promising. I found medicagos in great number, and in the dry, cultivated soils of one almond grove, to my keen pleasure, I found a species of medicago (*Medicago scutellata*) that I had looked for in vain in Algiers and Morocco, covering the ground with masses of its peculiar burs. The green stems and leaves had so completely dried up and disintegrated that there was not a fragment to be found anywhere, and yet from the quantities of seed pods, I feel sure that in spring the ground must be covered with a solid mass of this plant. McKee has found that this species matures earlier than any of the others and is one of the heaviest seeders, and I believe it may yet find its proper place in the agriculture of our Southwest. I secured seeds in the Botanic Gardens in Madrid when I was there with Mr. Lathrop in May of 1903, but I had never before seen an orchard where it was grown in such abundance.

As we were driving along up the steep winding road leading to the town of Soller, Wheeler spied a hole in the rocks. It had nothing particular about it to attract my attention but he wanted to stop, so stop we did, and Wheeler climbed up into the hole. There was a yell, ending in a word we had by this time all learned by heart, 'Vermileo!!!" He had found characteristic craters in the fine dust covering the bottom of the niche, and they were not those of the ordinary ant lion but of the rare vermileo. Out came the battery of cameras, the bottles and other collecting paraphernalia and when we left that hole in the wall Wheeler was walking on air, like a child with a new toy, and we had in the bottles every vermileo that had dared to build a crater in that dust, and a quart or so of the dust, too. Like the lampromyas found in the Guancho caves of Teneriffe this *Vermileo vermileo,* De Geer, is a "Leptid Dipteron," or fly, and because of its peculiar habits has a special interest, as I

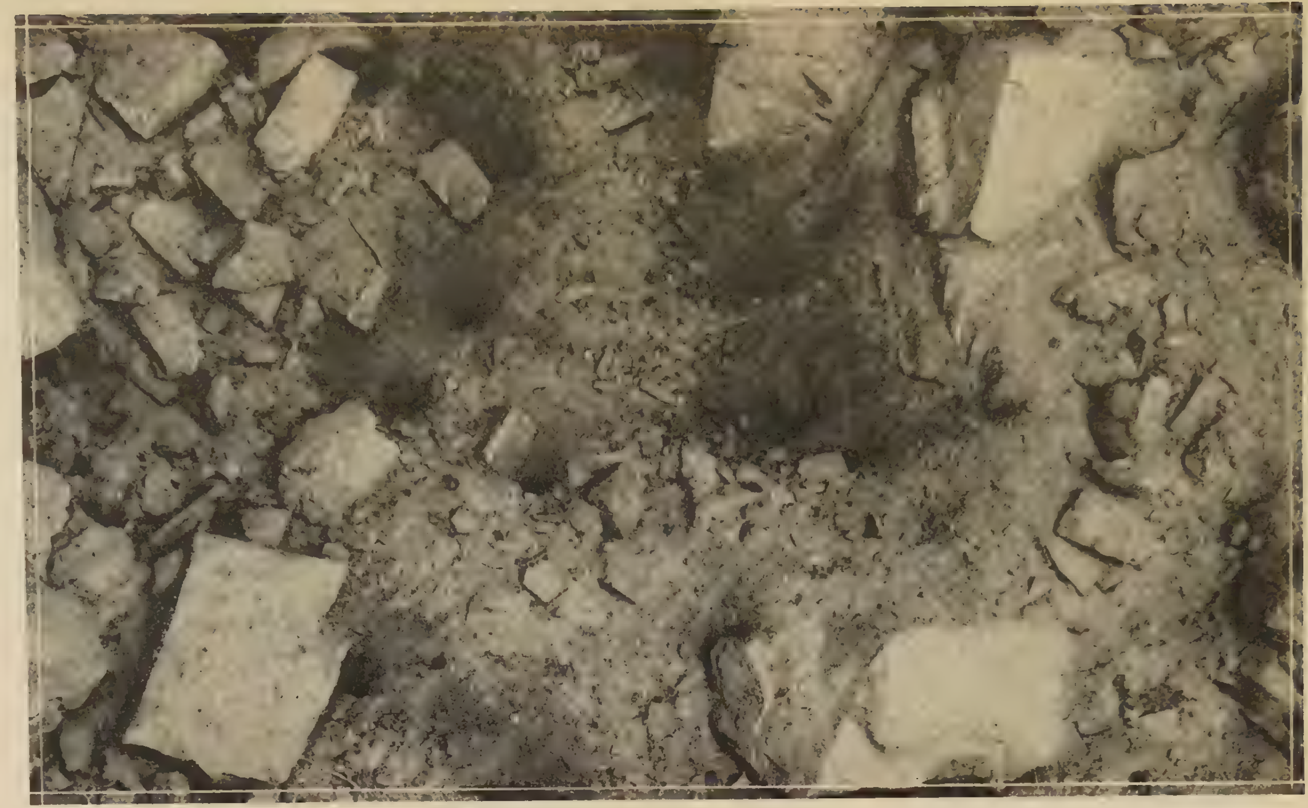
The hole in the rocks near Soller where Wheeler found the vermileos.

have already explained. Wheeler's care of his dust-filled jars in which were these two species of larvæ, was the care of a mother for her baby or a child for her dolly. He got them to Boston and they hatched out in the Bussey Institution and I presume the beautiful flies their pupæ produced are now somewhere in that Institution with horrible insect pins stuck through their thoraces, while a detailed description of them has already gone down into history.

But I have no inclination to belittle this discovery in any way, for it remains in my memory as one of the most splendid examples of a thing it were well for more people to understand, the fact that there is more delight in the discovery of a rare or new natural obect than in almost any other activity of the human mind.

Furthermore has not Wheeler inscribed one of his newly discovered ants as *Solenopsis latro fairchildi* subsp. nov. in the immortal book of insect descriptions that now includes a half-million names? I could wish of course that it were a species instead of a subspecies, but since I shall probably never meet it I shall not run the risk of mistaking it for its close relative, a subspecies also, discovered in Portugal.

We returned to the Utowana to develop our photographs, clean our seeds and identify our plants, and the next day were off again to the Monastery of Lluch where I had learned that the ballota oak had been grafted by some of the monks. It was a mysterious old monastery, with a touch of the new world in it in the shape of a kind of cafeteria where those who came on pilgrimage could get something to eat. We inquired of the Father Superior, and he referred us to a colleague who escorted us to a hillside at the rear of the monastery where for the first time in my life I saw a grafted oak. There are several of these grafted trees near the monastery, the oldest being about ten years old from the graft. I made as careful arrangements as I could for the sending of grafting wood of this oak, but so far it has not arrived, and another attempt will have to be made in early spring. I was interested in these trees not only because they were grafted, but



Dust craters of the vermileos, formed by the larvæ of the strangest of strange flies.

because this ballota oak is a strain, or possibly it is a distinct botanical variety. I see that Rehder cites a variety *rotundifolia,* as having edible acorns and as being synonymous with A. de Candolle's var. *ballota* that has edible acorns almost as sweet as chestnuts. These sweet acorns are called *Campanetas* and are said to be round, whereas the astringent ones of the common evergreen oak of the Mediterranean basin, *Quercus ilex,* are called "del'ordre" which I suppose means common.

The scenery of the interior of Majorca is superb. Its calcareous cliffs, terraced to their summits for olives, were a never-ending source of pleasure, and the Caimari valley I thought one of the loveliest I had ever seen.

Dr. Porcel kept telling me that I ought to see the tomato terraces of Bañalbufar. I have photographed a thousand acres of tomatoes in one great field on the marl prairies of South Florida and have seen tomato plants wherever I have traveled all over the world, and I thought I had seen all the tomatoes I wanted to, but Dr. Porcel was insistent, so one morning Wheeler, Graham and I set out for the terraced land at the north side of the island. The "bug hunters" deserted the cab at the first likely looking collecting ground, leaving Doctor Porcel and me to push on without them. A turn in the road brought the terraces into view, with their concrete irrigation basins and canals, their beautifully kept-up trellises of cane to which were carefully tied the finest looking lot of tomato plants I ever saw. Near by was a small building that I took for a house, and as the windows were open I glanced inside. The room was filled with a gorgeous glow of red color, a tomato red color. It came from the walls, which were covered with strings of ripening tomatoes; it came from the ceiling, which was a solid mass of tomatoes hanging in strings four feet long. There were 117,000 tomatoes hung up in this smallish room and these 117,000 tomatoes were all of a uniform size and color!

Years ago I tried to dry the paste-making tomato of Italy, "Umberto Primo," I think it was called, by hanging it up to dry

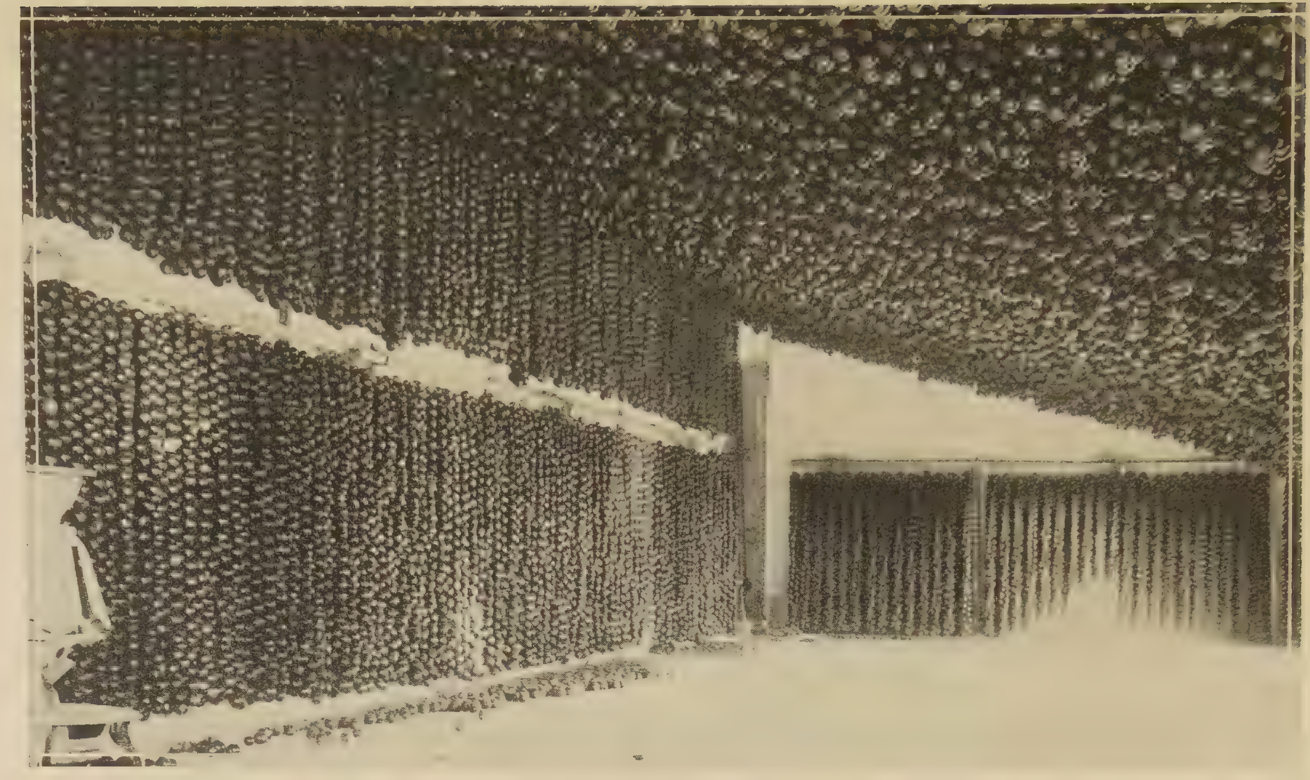
Tomato terraces of Bañalbufar where a remarkable rural community has grown up around the Ramallet tomato.

in my kitchen, but the results were disastrous, for the tomatoes all fell off and were squashed on the floor. I naturally looked to see if there was not a nasty mess on the floor of this drying house but not over a hundred of the 117,000 had fallen off.

It seems that about seventy years ago a man by the name of Ramallet discovered somewhere "in the forest" a single tomato plant that struck his fancy. It produced tomatoes of the right size and had stems that did not easily separate from the fruit, and these two characters made it adapted to the particular practice existing all over the islands of threading the tomato stems and in this way suspending the tomatoes until they are dry enough to ship to Barcelona. By careful selection this variety has been maintained in the region of Bañalbufar, and to-day there has grown up around it a civilization of more than two thousand people, who get their living out of the export of a million and a half kilos of dried tomatoes to the mainland of Spain, to be used in the manufacture of tomato paste for the spaghetti and macaroni which form the staple foods in that part of the peninsula. During the stringing or threading season over 700 men, women and children spend from daylight to dark threading these beautiful tomatoes and hanging them up to dry. I sent some of the seeds of this variety to America and we grew them two winters later in our own garden in Coconut Grove, Florida. The variety did particularly well and attracted no little attention because the fruits were so uniform and so easy to peel.

Dr. Porcel also informed me that there was a rice culture in Marjorca of considerable importance to the island. I had in the "Seed Drawer" on the yacht some especially selected varieties of rice which my friend Chamblis had made from the early-maturing Shinriki rices we had introduced into California from Japan in the early days of our introduction work, and these I thought might be acceptable to the rice growers of the Balearics.

The rice area lies at the edge of the flat alluvial plain bordering Alcudia Bay, the largest properties being those of the Albu-



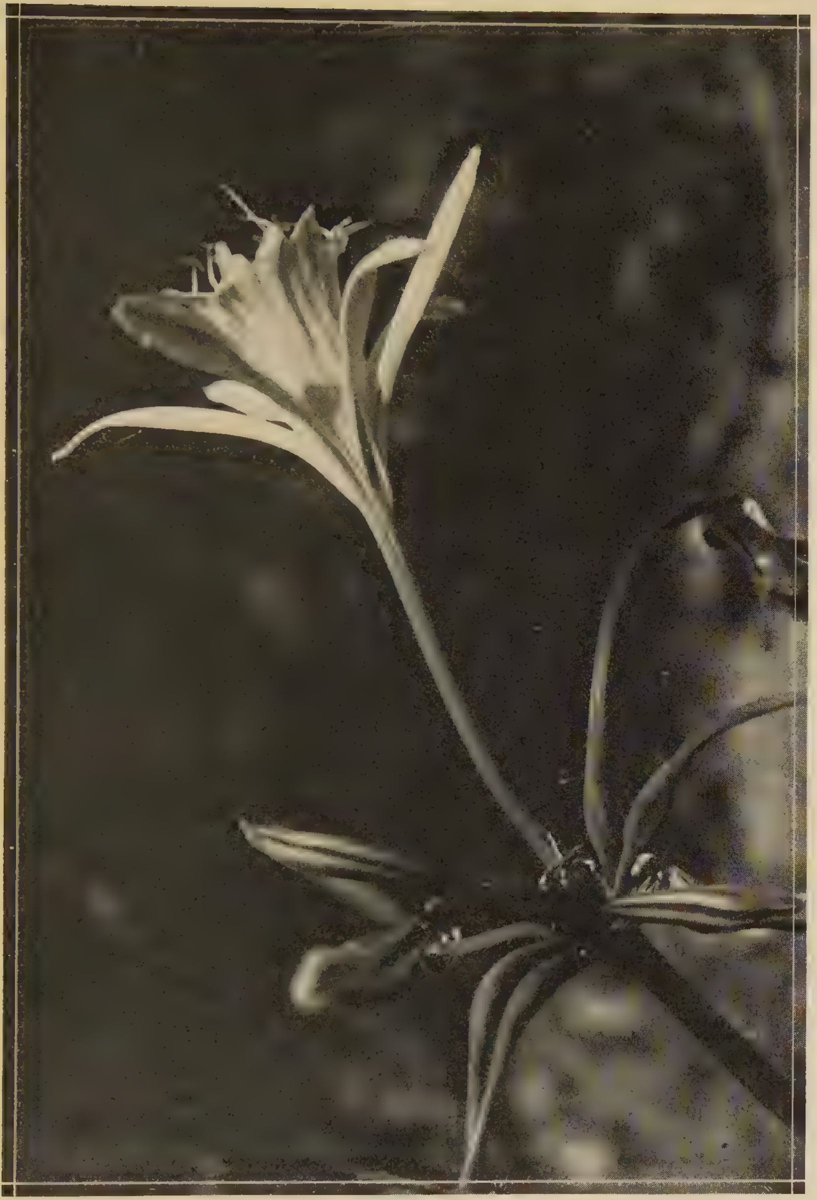
Drying room at Bañalbufar with 177,000 tomatoes strung upon threads to dry. The ceiling was hung four feet deep with tomatoes. Yet so firmly is the fruit attached to the stem that hardly any had fallen off.

fera Estate. Don Fausto Gual de Torella, the manager, was delighted with my offer of seed rice of a different kind, although true to form he began to shy at the idea of a new sort which might not be so acceptable to the buyers, but I trust that these varieties we gave him may prove of value.

I was surprised to find a paper mill on the same estate, and as the paper was a wonderfully tough brown kind, just what I needed for dryers for my plants, I had several reams of it cut to take back to the yacht. Don Fausto told me that this remarkable paper was made exclusively from the fiber of the native reed (*Phragmites communis*) of which there were 1800 hectares growing in the waste areas around the rice plantations. I once spent two years investigating the possibilities of this reed, which grows wild in the estuaries and low swamp lands of America as well as of the Mediterranean region, so of course, I was interested. I learned, as I had expected, that the company was finding it very costly to harvest the reed, even with the cheap labor available there, and unless they could make a more expensive quality than the brown stock they were then turning out, it would not, he feared, be a profitable business. This is to be regretted, for the paper was excellent and its manufacture, if profitable, would utilize vast areas of land unsuited for any other culture.

As we drove about the rice plantations, I saw here and there low windmills with unusually large wings; as we drove on through La Puebla the number increased, until it seemed as if the landscape were infested with windmills, as certain Texas landscapes are with oil derricks. Some one told me there were a thousand in this valley, but as it was already dusk and we were due back at the boat that evening I never have been able to verify this statement. The low water table of this valley has made windmill irrigation very profitable.

The Island of Minorca where we spent two pleasant days will always be connected in my mind with a species of bulbous plant very little grown in America, *Pancratium maritimum.* I suppose

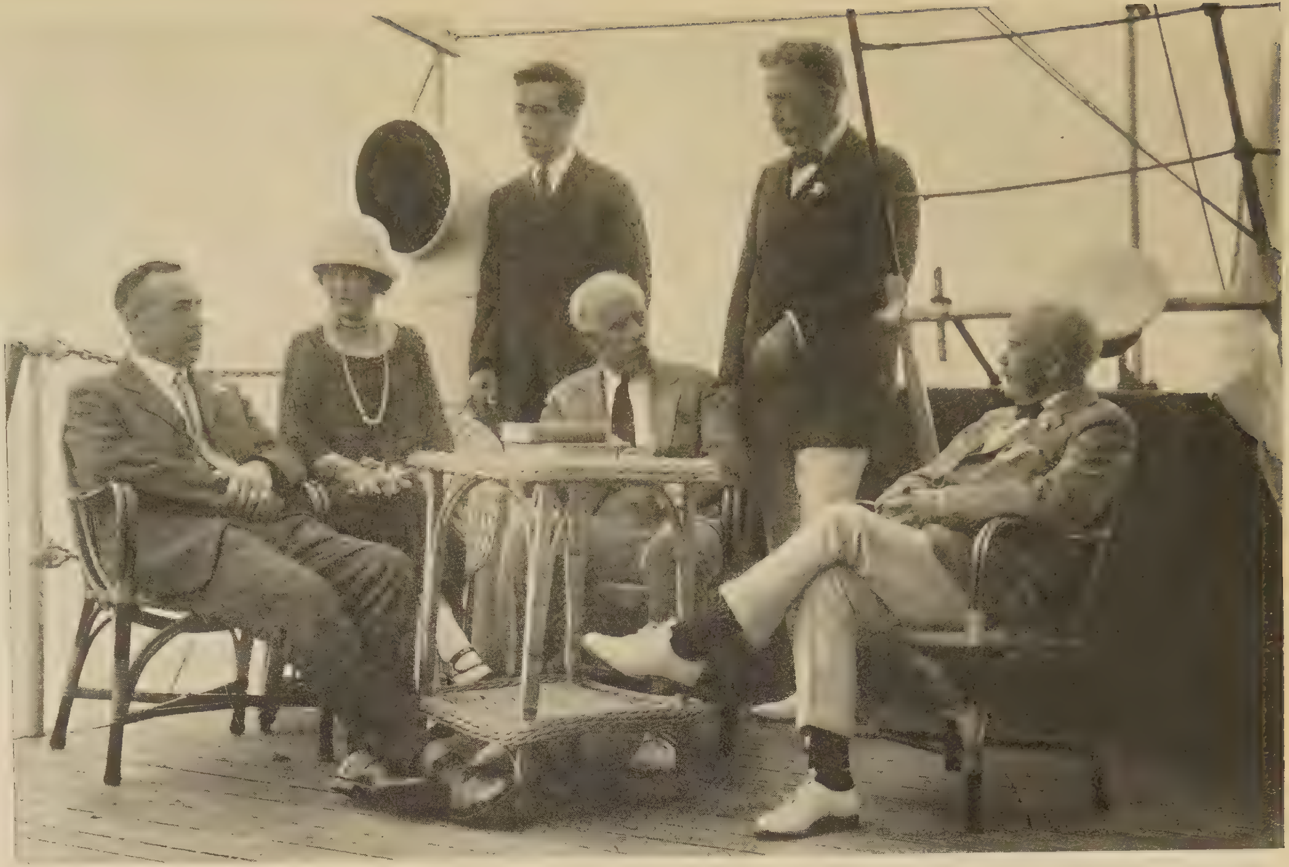


A bloom of the wild *Pancratium maritimum* from the Barranco de Calamporter.

I had seen this species in collections in the greenhouses somewhere, but when I was told that it occurred wild in a little "plage" or beach on the estate of the Marquis de Menas Albas I got Wheeler to go with me to see it. It was a beautiful sight. Scattered over the sand that formed the bottom of the little Barranco di Calamporter there were thousands of the loveliest imaginable lily-like white flowers, rising like giant daffodils, a foot or more above the sand. We gathered all the seeds we could, for it seemed possible that there might be beaches on our Atlantic coast, perhaps in Florida, where this pancratium could be grown and gladden the eyes of those flower-lovers who remain in the South throughout the summer.

It seems like a very short run from the Balearics to the Italian Riviera, but there were some of us who thought it a rather long one with a good deal too much movement up and down.

Mr. Armour had put a special porthole leading onto the aft hatch so that the light in the laboratory was ideal, and I found that I had no trouble in microscopic work with magnifications under 500 diameters. The boat was so steady, never rolling enough to give us any real trouble, that even when there was a good deal of motion I should have been able, by bracing myself, to do microscopic work quite comfortably. The books in the library once in a while took to popping out, but this was before Mr. Armour devised a spring arrangement which kept them splendidly in place. Every detail of arrangement was perfect. The trouble was in the interior mechanism of my own make-up, which slowed down as the swell rose, until there came a time when anyone might have pitched the microscope overboard for all I cared. It was on such days as these that Wheeler would sit and devour book after book and smoke so many pipes full of tobacco and burn up so many matches in doing it, that he nearly ran the yacht short of safeties. It was at such times as these that I ceased to wonder that there were so few serious scientific books written on board ship.



Members of the first cruise. From left to right: William M. Wheeler, Mrs. Jordan L. Mott, Graham Bell Fairchild, David Fairchild, Allison V. Armour and Jordan L. Mott.

Then too, the engines were not doing as well as Mr. Armour wished they would and there was some discussion and worry about them. However, the sea calmed down in time for us to be able to enjoy the sight of the ragged outlines of the villa-topped cliffs which greet one on arriving at Porto Fino. Besides, it was bringing to a close what for Mrs. Fairchild and me counted as one of the longest separations of our married life. She had flown away from me in June and enough things had happened to make the three months of separation seem like a year.

Mrs. Fairchild and our two daughters, Barbara and Nancy Bell, joined us in Santa Margherita. We said good-by to Mr. and Mrs. Mott and their young doctor Geddes, who were to spend the fall on the Riviera, and left for Genoa where Wheeler caught a boat for Boston. So the Utowana's trial cruise was closed with a flourish. She had behaved pretty well, but not to Mr. Armour's entire satisfaction so far as the Diesel engines were concerned.

CHAPTER XX

EQUIPPING IN ITALY

Now came the more serious work of equipment for the Moluccas trip, which would require the greater part of two years, and mean the long hard pull through the Indian Ocean from Aden to Columbo, all the way in tropical seas. Unless you have tried to make purchases of such equipment as you will need for a long trip to the tropics, and made them in a foreign country where you have had to bargain in the technical jargon of a language you have not used for years, and unless you have tried to jump from Spanish into Italian at the same time, you cannot understand the strain that this "shifting gears," in a language sense, conveys. Since leaving America we had been obliged to revive and polish up our knowledge of French, Dutch, Spanish and now Italian. When your main object is to converse on topics of the day, this is intensely interesting, but it is a bit trying when you are endeavoring to get wardian cases built and the Italian carpenters have never seen such a glass-covered box with wire-covered trays in it and arrangements for electric wiring, etc., etc. Try to order special envelopes printed and folded in a particular way and you will discover what I mean. You find that you are in a world of new terms that daily conversation does not fit you to handle so easily. You also get in this way some idea of the strange places where progressive shopkeepers and manufacturers have to struggle along with their business in a city built in the Middle Ages. But most of all you are impressed with the number of holidays that come tumbling in on you from the Church, the State and the Labor organizations, all of which are vieing with each other in the advertisement of their particular social holidays. In the Orient where there were Chinese, Malay, Catholic, British and

Dutch, this holiday bogey became so bad that I think I was prepared to organize an anti-holiday society that would give men their vacations when they wanted them, instead of in the obligatory driblets that the once-a-week or the once-a-year holidays give. I have never seen any attempt made to estimate the cost of these enforced holidays that crowd the beaches and the hotels and the trains and the roads with millions of people, most of whom would rather let their holidays accumulate so that they could go somewhere else besides the same old near-by resorts, and have a real rest and change instead of all these hectic days with a fractious family.

It was agreed that the real expedition should start from Genoa the end of October. This would bring us into the Indian Ocean at the season which is free of storms as indicated in the Monsoon ditty by the line "October, all over."[1] For to cross the Indian Ocean in the Southwest Monsoon season would mean a month of ghastly discomfort for all but the most hardened sailors of the yacht's company and might even mean the destruction of the yacht in one of the terrific typhoons which sweep that ocean from June until October.

An American expert on Diesel engines took over the work of getting Utowana's engines in first-class shape, and during the interim Mr. Armour returned to America to arrange business affairs preparatory to his long absence, and the Fairchild family retreated to Geneva to make further educational arrangements for the girls, and to gather more data regarding the islands among which we expected to cruise.

Leaving Geneva October 21st we stopped a day at Stresa, on Lake Maggiore, the loveliest of the Italian lakes, where the severity of the climate is modified by the lakes on both sides of it, and where, to the surprise of most Americans, the Chilian conifer *Araucaria imbricata* grows beautifully in the open air. It was interesting to find splendid specimens of this species side by side with our American tulip poplar (*Liriodendron tulipifera*), pollarded just as the Europeans are so fond of pollarding the sycamore to give it the low-spread branches they like for shade over their gravelled terraces. In a private yard stood a tree of the Japanese persimmon, loaded down with ripening fruit, together with a fine specimen of *Datura suaveolens,* its great trumpet-like flowers shedding their heavy fragrance on the breeze. Our *Magnolia grandiflora* neatly trimmed into pyramidal form, the ripening red fruits hanging among its glossy leaves, held the position of honor in front of the Casino. To one familiar with the ornamental trees of America, this group of exotics will give a better idea of the climate of the Lake region of Northern Italy than any number of figures.

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[1] "June, too soon, July, stand by, August, you must, September, remember! October, all over."

Genoa has always been a port of sentimental interest to me because it was from there that in 1895 I sailed away on my first voyage to the tropics. I had never been back and I tried to find something of the old town of those days, but detected only a fragment of it tucked away almost out of sight. It has become one of the best-conducted ports on the Mediterranean, since Mussolini has stopped the eternal dockworker's strikes that used periodically to put it in disorder. The Italian Embassy in Washington, when it viséed my passport, had of its own free will given me a short paper asking that I be granted the freedom of the ports of Italy. This was of great convenience and had vastly more effect than did the showing of the passport itself, impressive as that was with its rubber-stamped signatures of eighteen nations. But even so, the going back and forth to the yacht in the harbor was always attended with some formality and every new guard had to be convinced of our eligibility to pass the lines.

The Utowana herself, lying snugly in her berth came near meeting a sad fate. Two great freight steamers whose hulls rose above her like fortresses, swayed at anchor in a storm, and like a giant nutcracker crushed her between them. Fortunately the injury was not serious, and it could be repaired, but it gave us all a start. We had often speculated on the delicate balance of the Expedition wherein the illness of any one of the small group might upset our plans, but that anything could happen to the sturdy Utowana had scarcely entered my head.

I could not leave Genoa, however, without a visit to the Instituto Botanico and a call on my old acquaintance Professor Penzig who since its very beginning had been its director. It was endowed by the same Sir William Hanbury who built and maintained the famous Botanic Garden at La Mortola.

I had been in it in 1895, but the trees that were then young had grown so that I had difficulty in finding my way to the entrance. Prof. Penzig was in quite feeble health but went over the garden with me, and his charming daughter accompanied us. Of the things that struck me as worthy of my camera, one was a very old tree of the Mexican type of avocado.

To the Professor it was little more than a fine specimen of *Persea americana.* To me it was a striking example of the fact that in the sheltered gardens of Northern Italy this remarkable fruit tree might be cultivated, but the entire lack of a demand for the avocado was dramatically shown by the fact that the fruits of this great specimen were allowed to rot on the ground. It is true that they were eaten occasionally but no attempt is being made to build up an avocado industry. Compare this with the feverish activity of California and Florida avocado growers and you get an accurate idea of the difference between the conditions of horticulture in Europe and in America in so far as they have to do with the origination of new plant industries. It is an expensive thing to build a new plant industry. It costs the fortunes and the lives of the pioneers, the best men and women a country has.

As we strolled along the terra-cotta terrace in front of the Laboratory Building my attention was attracted to the many plants growing upon the tiles. There they were, not in tubs, but flat on the tiles. I inquired, and found that even the large cycad, higher than my head, was rooted only in a bed of sphagnum moss. Azaleas and heaths of various kinds were growing happily there and Prof. Penzig spoke of their care in a way which led me to think that one could grow almost any kind of acid-loving plant in beds of sphagnum on tile terraces as easily as in the ground. The absence of tubs gave them a natural appearance which I found quite fascinating. The cycad had been planted thirty years ago, had never been fertilized, had been watered every day, and new moss added as the old decayed.

At last every detail of the seemingly infinite number necessary before a boat is ready for such a cruise had been attended to. Mrs. Frank M. Whitehouse, Mr. Armour's sister, and Mr. Whitehouse had come over from New York with Mr. Armour, keen for the long cruise, and as ship's surgeon, Dr. Lawler, experienced in the Panama Service, had accompanied them.

Mrs. Fairchild and Miss Penzig measuring an old avocado tree in the Instituto Botanico of Genoa. Its fruits are allowed to rot on the ground because no one cares for them.

We slipped out of Genoa and were off on the 4th of November bound for our last stop before the real "take off."

The yacht's compass had become so confused by its long stay between the big steel freighters in the harbor that we had to turn around several times before she got her sea legs, as it were.

While all of these preparations had been going on in Europe and America we had cabled to my old friend P. H. Dorsett and his son Jim, who had been three years exploring for plants in the mountains of Manchuria, inviting them to join the Allison V. Armour Expedition. Arrangements had been made that during the arctic winter, when they could do no work in the snow and ice, they were to come to Ceylon and take part in the hunt for tropical plants. It was exciting to think of them closing up their work on the other side of the world and starting for the rendezvous in Ceylon, at the same time we started from the European side.

These cycads, azaleas and heaths have for thirty years been growing in sphagnum moss without any soil, right on the tile terrace of the Instituto Botanico in Genoa.

All at once the whole situation changed. "Trouble in the engine room." The Diesels were not functioning smoothly. One of the cylinders had gone out of commission and a new cylinder head had to be put on. Then another one split. By the time we reached Naples there had arisen one of those dilemmas that try the spirit and patience of men to the snapping point. The cabling began. New parts from Sweden? This meant at least a month's wait in Naples. Every angle of the case was considered, and the final decision was to send the plant-collecting contingent ahead, have the Manchurian collectors meet it in Ceylon and leave the yacht to follow later. After all, the collecting could be started and the unusual facilities offered by the Utowana would be most needed after the preliminary work had been done.

It took some days for us to realize that this was the only thing left for us to do, and in the meantime there was an opportunity for me to renew an association connected with my first foreign experience, that of a student at the Stazione Zoologica or Marine Biological Station, whose white buildings stood facing us in the Villa Nazionale.

What a rôle this Station on the Bay of Naples has played in the development of the great new science of Heredity! The world at large does not realize that to build up such a science as the science of Genetics requires millions of observations and discoveries. When I was there in 1894 it was in the early days of the study of the cell; in those days when the chromosomes were new things and when to see them divide in karyokinesis sent a new thrill through one. The very terms that to-day are taught in the public schools were new; "mitosis" was coined in 1882 by Flemming and "centrosome" was only named by Boveri in 1888.[1] We were all of us hunting for that vanishing point in the cell from which was supposed to emanate the power which divided the living cell itself. Like astronomers, each in his own monastery-like laboratory, every man was training his microscope on the movement, not of the stars, but of the chromosomes and centrosomes in the living cell. The research men had poured into Dohrn's Institution by the sea from all the great laboratories of the continent and of Great Britain, and American Institutions had begun to send men. There was a feverish but quiet excitement about the place in those days when every one stood, as he thought, on the brink of some discovery. To anyone who has never made the slightest contribution to the sum of human knowledge, that crowd probably appeared as just a lot of funny-looking, carelessly-clad men who herded together and talked a language quite unintelligible to anybody but themselves. Yet it is out of the thousands of printed pages which their days and nights of passionate study produced that has emerged much of the information that gives mankind to-day the definite and advanced position it holds in an understanding of the living matter of the globe.

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[1] Wilson, E. B., "The Cell in Development and Heredity," 3rd Edition. Macmillan, 1925, p. 11.

I found the old place filled with strange memories. All the familiar faces had disappeared, save that of the erstwhile Secretary, Dr. Lindner, who took luncheon with me and told me of the affairs of the Institution and how they had suffered during the war. The great originator of it all, Dr. Anton Dohrn, had long since gone. My particular friend and first guide into the early secrets of the division of the cell nucleus, Dr. Paul Mayer, had also gone, but, as I stepped into the old laboratory where for six months I had peered down the tube of my first microscope, I saw among some papers on a table, quite by accident, his photograph. It had been put there a few days before during some changes that were going on in the Institute. The coincidence startled me, as such coincidences always do.

Other and brighter days will dawn for the Stazione Zoologica I feel sure, for it is under the admirable management now of the talented son of its great originator. With a growing understanding of the value of research will come the ample support which it deserves and somewhere among the crowds who will pass through it will appear another Virchow, a Flemming, or a Boveri to advance our knowledge of the living substance.

The Jardino Botanico di Napoli was the first botanic garden I ever visited in Europe and I remembered some of the beautiful trees which used to grow in it, particularly a splendid specimen of the Canary Island strawberry tree (*Arbutus canariensis*). I called upon the Director and was pleased to find the noted plant pathologist, Professor Cavara, at the head of the gardens. He was most cordial and in addition to a tour through the garden in search of the arbutus which, unfortunately, had disappeared, he presented me with several pamphlets, one of which related to the experiments being made in the cultivation of the opium poppy. I had just come from the seat of the opium poppy dispute in the League of Nations and was naturally surprised to find that attempts were officially being made to grow a plant whose cultivation in Persia the League was trying to stop. Over a year later I was at the house of my friend Arthur Bullard in Geneva when Mr. Frederick Delano of Washington walked in. He was just back from his trying trip through Persia as head of the Opium Poppy Commission to investigate the poppy growing there and to suggest a substitute crop. He had scarcely been seated when, turning on Mr. Bullard, he remarked, "You wished on me in the Italian member of the Commission a charming Professor who seemed curiously interested in finding out every detail of how poppies were grown in Persia." I broke in with the inquiry as to what his name was, for it occurred to me that perhaps it was Cavara, and this proved to be the case. Later Mr. Delano invited me to lunch with his Commission and I found myself seated beside my accomplished plant pathologist, Director of the Jardino Botanico di Napoli.

CHAPTER XXI

OFF TO CEYLON

Before we left Naples, our host, with that hospitality and courtesy for which he is famous, sent invitations to tea to the Staff of the Zoölogical Station, the Director of the Botanic Gardens and to my old friend Prof. Lopriore who had charge of the Plant Pathological Institute at Portici. With the Dorns came Mrs. Edmund N. Harvey of Princeton who was studying in the Station. It was a jolly party and served in lieu of the real "take off" we had planned.

Mr. Armour looked up boats and found that the best one for our purpose was the "Emil Kirdorf" of the Hugo Stinnes Line bound for Columbo the 21st of November. She came in the morning of that day and anchored in sight of the yacht and we were ready by dusk, Mrs. Fairchild, Graham and I, to be taken over to her in the launch. It was a sad party. The rain was falling as Mr. Armour took us across to the Kirdorf. I can see, in my memory, the light as it shone on his wet raincoat when he returned to the launch and left us on the brightly lighted deck of the ocean liner. We were leaving the yacht and its owner and our other friends behind, and were off alone for the Orient.

We left at dawn and waved to the Utowana as we passed her at anchor and were soon immersed in new surroundings. The route through Port Said and Suez was one I had traveled several times before, once as a semi-invalid in an officers' cabin, on a German Lloyd ship to Sweden from Ceylon, after I had contracted a case of typhoid through which Mr. Lathrop had nursed me. But that was long ago. The war had come and left great changes. Still, here we were on the same type of ship we used to like in those days, steady, but not so large that one forgot one was at sea. The crew and stewards had been gathered from the remnants of the great German lines of the pre-war epoch.

I thought I recognized the head steward; he had been on several of the German Lloyd boats on which I had traveled. He told me with tears in his eyes how happy he had been when he first saw the sea again, after eight years on land. Our cabin steward, who did everything with what seemed to be unusual care and courtesy, had been the electrician on one of the great Zeppelins during one of its raids over England. It was nice to see again such strictly German delicacies as Westphalia schinken, together with pumpernickel and rye bread. I made my breakfast on the raw ham and rye bread, having it served in a corner of the sunny deck where I could see the blue waters of the Mediterranean. It brought back memories of a summer I once spent in Westphalia where I used to see the women carrying the little pigs to market in their aprons. I conceived a fondness for Westphalia schinken which I have never been able to satisfy in America where the trichina makes ham that is not cooked, rather dangerous.

Then there was the ice water. You had to order it specially but you could get it. Mrs. Fairchild drank it often, just as she would at home in America, and was troubled by indigestion. The sympathetic head steward came to me one day and with all sorts of apologies for giving advice which had not been asked, offered the suggestion that her whole trouble came from drinking too cold water at her meals. Beer was better. I tried the beer and found the steward's prescription an excellent one, even though I assured him that in America a hundred million, more or less, drink ice-water with their meals.

Stromboli was active and although it was nearly dusk the steamer ran close in so that we could see the red-hot lava streaming down its cinder cone, and the puffs of smoke as they rose with each explosion. To an American who never has occasion to be reminded by lava flows or fumaroles that the earth is volcanic, an active volcano is always a thrilling object.

At Port Said there was the usual wait for a few hours. The town had grown and extended in all directions since I last visited it, but was still the same utterly untidy and messed-up place. I found my noiseless typewriter awaiting me at the American Consulate where I had sent it to meet the yacht and I took it along. We bought our pith helmets and had the usual struggle with currency. We strolled about the dimly lighted streets and through the bazaars and got our first whiff of the Orient, for Port Said is its portal. The following day we called at Suez and with Captain Zogel and the Lehmans, our table acquaintances, visited the only thing to see there, which was the Christian burying ground, ghastly beyond words with its fence of wooden pickets about each grave and its tumbling iron crosses with not a living plant to be seen. "Sacred to the Memory of—" How could there be anything sacred in such a spot?

The Red Sea as I saw it on this trip had a new interest, for there seemed a possibility that we might on the return trip in the yacht stop at some of its ports, such as Hodaida, where we could perhaps get a glimpse of the orchards of Khat (*Catha edulis*) on the highlands of the interior from which come thousands of tons of green twigs that are chewed by the Arabs of the region for the stimulating drug they contain. In Arabia the effect has been described as similar to that from a glass of champagne. We had introduced this into Florida and grown it successfully, but none of us could get any effects from chewing the twigs. Why should it have the alkaloid in its leaves in Arabia and not in Florida was the question. That indefatigable explorer, Charles R. Crane, did get to Hodeida, and one of his friends remained there some time and reported to us that the Amir of Yemen had decided that his people had become too addicted to the habit of chewing Khat twigs and that he must wean them from that habit by the substitution of tea. He appealed to Mr.

Crane. Mr. Crane appealed to me, and I did the best I could to put the Amir in touch with a supply of seeds of the best teas. Khat chewing is an ancient custom and I doubt if the Amir can break his people of the habit so easily.

The twenty days on board passed rapidly and I found my noiseless typewriter a great comfort even though it never worked properly and had to be sent back to the factory and replaced later with a new model.

Colombo had many associations connected with earlier visits and when, late one afternoon we landed there it seemed as though twenty-five years had made few striking changes. It is true the Grand Oriental Hotel was being enlarged, as the Gall Face had already been, but the stores seemed much the same. The chief change was that automobiles had almost taken the place of gerries. I suppose it is hardly to be expected that a town with only 2000 white people scattered among 240,000 of various native nationalities should be able to grow as a community does that is made up of whites alone, especially when it is remembered that many of these do not have their families with them.

Everything starts at sunrise in the tropics and so we felt that our experiences in Ceylon started when the "boy" brought in our tea, toast and bananas at six o'clock next morning. It is then that the birds waken and sing, the gorgeous sunshine floods the verandah, and the cool, still air refreshes you and you think there never was so ideal a temperature. Unfortunately it is only for a brief while, for no sooner is the great sun's disk fully above the horizon than the glare begins, and until late in the afternoon makes all objects so bright that you shrink from looking at them.

All sorts of preliminaries had to be gone through. I can conceive of nothing more tiring than the first day ashore in a tropical city after a long ocean voyage. It is taken up with waiting in dirty, hot shops for deliberate shopkeepers, wrangling with jinriksha coolies, refusing the offerings of street peddlers, accommodating one's self to the new foods and sights and smells, and keeping the perspiration from soaking you through.

One thing you are not prepared for, and that is the speed with which made-to-order clothing, such as it is, can be turned out. In a day or two you are dressed and booted for the tropical life, thanks to the hundreds of eager hands that can thread a needle and run a Singer sewing-machine.

If we were to collect in Ceylon we must have a car and a native to take care of it. There had been many accidents on the winding hairpin turns that characterize the mountain roads of the island and we wanted a good driver. John turned out to be one, honest, obliging and careful. One curious thing we soon observed about him, he could not carry on any conversation and drive at the same time, also his reaction in an emergency was just a trifle slow, slower than that of the average European, and it sometimes gave us a start, and made us wonder if he were going to get out of danger soon enough. This slowness of reaction toward danger on the part of the Singhalese and Tamils is a striking thing and in contrast to the quicker response under the same conditions of the Javanese, the Battacks of Sumatra and the black men of West Africa, as I learned by experience later on. John told us that he had to carry a stick when driving in some villages in India with which to beat the bewildered natives on the head to make them get out of the way.

We stepped directly from the boat into the very most interesting, and, as I see it, the most important problem confronting Ceylon to-day, that of the so-called "Burgher," the descendant of a Dutch father and a Singhalese mother, for some of the most interesting and influential men with whom we came in contact were of this class, and have risen to high positions in the island by virtue of their industry and their native inborn talents. These exceptional ones stand out as examples of what the Burghers can do, but the question is not one that can be decided by a few examples, one must know what the average is going to be.

The time is rapidly approaching, in my opinion, when man will take a very different view from the one he does now, regarding the mingling of those carriers of heredity, the chromosomes, of two widely distinct races. He will begin to ask what happens when two individuals whose histories have been as widely different as those of a Scandinavian dating back to the Visigoths and those of a Singhalese with a history lost in the migrations of tropical jungle peoples are tied together in an egg cell and begin the formation of a new hybrid race. We can expect a certain degree of uniformity when we join two sets of chromosomes whose lines of descent have run parallel or have intermingled for thousands of generations, but when those of widely different ancestry meet to begin a new mixture of their genes, we do not know what to expect in any but the first offspring, because the parent genes do not really mix until they prepare for the second generation. The reason why there is so much misunderstanding regarding so-called half-castes is that people in general do not distinguish between the hybrids born of the first intermarriage and the progeny resulting when these hybrids marry other hybrids. When hybrids [1] made by the intermarriage of widely different lines of descent intermarry, the result is commonly great variation, many different types being produced. In the case of human half-castes we are almost sure to pick out the remarkably intelligent or intellectual or physically unusual types and forget all about the others, no matter how poor and worthless they may be.

Until so-called races of men can come to look upon this whole question of the succeeding generations in a scientific rather than an emotional, personal, or mystical way there will continue to be the bitter race jealousies which come from the refusal to see that it is not the question of one race being superior to the other, but simply that it is different. Each race should be unwilling that experiments in hybrid-making on an extensive scale should be made until we know more about race mixtures. The trouble is that once a hybrid, always a hybrid. The reaction is not a reversible one, race mixtures cannot be unscrambled.

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[1] I use this word to designate crosses between distinct races. Cf. Altenburg, E., "How We Inherit." Henry Holt, 1928, New York. An excellent popular book.

So when, as was often the case, I was questioned in Ceylon and Java by very intelligent half-castes, as to why in America the white man did not treat the negro as his social equal, I explained that in view of our disbelief in the desirability of crossing these widely different races we had come to feel that we must either stop social intercourse between them at the threshold of our homes or at the altar. We believe it is easier to stop it at the threshold, and the popular feeling, amounting in America to a feeling of caste, helps in keeping the two races in their proper genetic spheres.

Ceylon, historically, is one of the most interesting of the tropical islands of the great Orient. It was one of the first to be colonized by Europeans, having been occupied over 350 years ago. It has one of the oldest and largest of the botanic gardens of the world. It has long served as a sort of vacation place for tired Britishers worn down by the excessive heat of India, and it is on the direct route of round-the-world tourists, with a splendid harbor where one can see at any time boats from pretty much all over the Eastern world.

It has been the favorite place of all others for the carrying out by the British of their experiments in the development of tropical plant industries, and the stories of the fortunes made and lost in the plantations of Ceylon are most fascinating. There was first the rise of great coffee "estates" only to be destroyed by the rust fungus (*Hemileia vastatrix*), so carefully studied by Marshall Ward; then the substitution of tea when the coffee was gone and the development of Ceylon black, machine-dried tea. There were attempts to grow Cinchona for the manufacture of quinine, which failed, and unsuccessful efforts were made to grow cacao. At present one of the chief sources of revenue of the island results from the successful introduction of the Brazilian rubber tree. All of these great pioneer experiments of the white race to utilize and cultivate the plants of the tropics seem to center in Ceylon, as they do also in Java. We were on historic ground.

A botanist from Northern climates, landing in Ceylon for the first time, finds himself overwhelmed by the wealth of forms of the plant life around him. He may have been accustomed to studying every nondescript plant that grows beside the roadways of the North, and of priding himself in being able to call each one by its Latin name at sight. He finds here that even the trees loaded down with gorgeous blossoms or hanging full of brilliant young red leaves, belong to genera with which he has no familiarity. The trees and large shrubs that he does not know are in such abundance that he finds no time for the annual and perennial wayside plants. He finds himself continually looking up at strange forms. The palms dominate everything, they are not confined to the so-called "Palm House" where he has been accustomed to seeing them; they are the greatest single glory of the tropics and he learns to have a reverence for them and a love of them which is perhaps in direct relation to the difficulty he experiences in telling the different species apart. They are a "difficult group."

The day after our arrival was Sunday, which means mighty little in the tropical Orient it is true, save that British offices and banks are closed. We had the car, and hearing that there were "orchards" of the mangosteen owned by private individuals at Kalutara we set out to see them. I was elated over the information that at last Ceylon had orchards of the mangosteen. For over a generation it was believed that the "Queen of Tropical Fruits" could be grown only in the Malay Archipelago; even in British India it had been a failure, but when I was laid up with typhoid in the mountains of Ceylon in 1900, Dr. Valentine Duke, to whom I owed my recovery, told me much of some promising small plantations of mangosteens which were being started in

Ceylon by a very intelligent Burgher named Wright and he gave me some photographs of the trees. This was all a quarter of a century before, and I hoped to see orchards of some size at Kalutara. We arrived there, but where were the trees? I saw one with its branches hanging over a wall and another one in another yard, hardly an orchard. Then I made inquiries. Nobody knew of anyone who had many mangosteen trees, plenty of people had one or two but nobody had many. At last by dint of much searching we found two more trees with young fruit on them, but that was all.

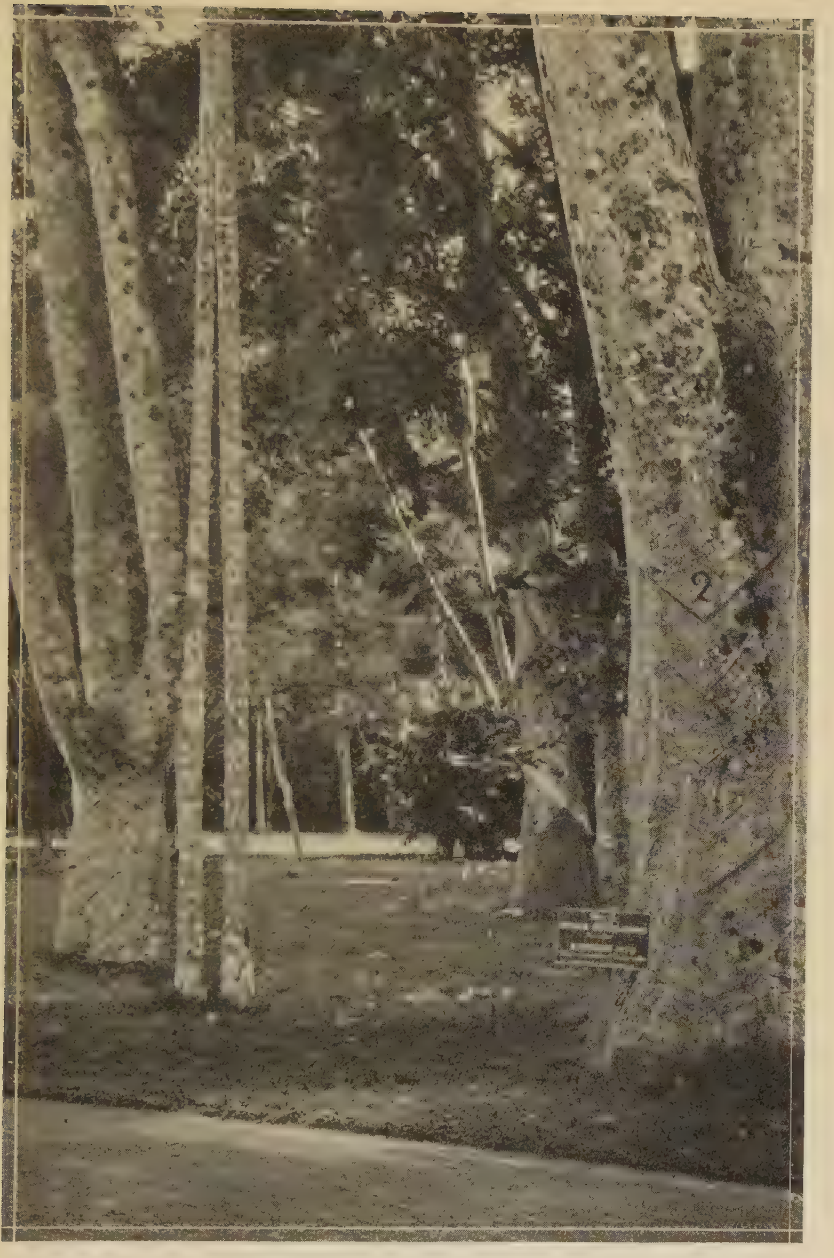
It was a boiling day. The first few days on land in the tropics, I have noticed, usually are "boiling days." Such a thing as a hotel or restaurant is unknown in most of the villages of Ceylon, so the Government provides resthouses where one can order a very simple meal at a very low cost, and rest on Government beds for a fixed sum. After lunch we had to wait until after the siesta hour before calling on the district judge, to whom we had been referred for information, so we poked around the place to see what there was of interest, and Graham found in the garden some gigantic snails, the largest living snails I had ever seen. He gathered a handful of them and in doing so cut his hand badly on one of them. When we finally did call on the Judge and told him of the accident he was quite disturbed, saying that one must be extremely careful with such wounds in Ceylon for they were likely to be very slow to heal. It made us realize that we were in the region of the real tropics where one has to watch one's blood-stream more carefully than in those zones where the rigors of winter thin out the number of species of trypanosomes and nematodes, and filarias and all the other parasites with which one has to contend.

Judge Carbery did not think there were any mangosteen orchards in his district. He was not much interested in the fruit anyhow: he had made a hobby of fine breeds of fowl and won prizes at the chicken show. And so ended our first mangosteen hunt.

The Judge's dislike of the snail was intense. "Smash 'em up," he said to Graham. "They're the curse of vegetable growing here. They call it the Kalutara snail, but it only came in from Africa a few years ago and now it is all over the place eating up everything. We offer prizes to the native boys for killing them." We had seen myriads of white snails devouring the vegetation in Morocco but those were small. It gave one a curious start to see snails almost as large as rats making their way up and down the coconut palm stems hunting for something to eat. Like the crabs of Florida, they pop when one runs over them on the roadway. Having enjoyed the snails of Paris not so long before, I asked if these were good to eat and saw that my question was received with scorn. Just about a year later, on the West Coast of Africa, I saw what is a close relative of the Kalutara snail sold at fancy prices on the native markets, being bargained for alive, and it must not be forgotten that it was the darkey of our South who taught the Southern gentlemen to eat the mud turtle, the terrapin of our banquet halls. "One man's food is another man's poison" I suppose, if only he thinks it is.

I can understand this when it applies to so radical a thing as snails, but when it is applied to milk I believe it is purely custom, nothing more. And in Ceylon we have a striking case of the milk prejudice. Pretty nearly all the European breeds of cattle have been imported at various times, but they are not adapted to the climate and have not done well. On the other hand the water buffalo thrives there and some breeds give more milk than the European cow, while the fat production compares favorably with that of the best Jersey strains, but because the milk has a bluish cast and looks "different," not a Singhalese nor a European will touch it. They would rather have canned milk. Mr. Armour and I bought some of the milk from a family dairy, took it up to the little hotel where we were going to lunch, had the waiter take it to the kitchen and boil it and serve it with our meal. I do not believe anyone who was not particularly on the lookout for it would have detected any difference between a glass of buffalo milk and one of ordinary cow's milk. When it is recalled that there are millions of acres of swampy lands where the buffalo is at home and that the ordinary cattle cannot exist there, it has always seemed strange to me that the best milch strains of the buffalo should not have been developed by the Europeans who live in the tropics. But perhaps, on the whole, it is fortunate that this has not been done, for now the meadow lands of the far north have something they can exchange for the products of the tropical zone, such as butter, canned and dried milk, and cheese.

In the low country of Ceylon are found jungles and swamp lands and paddy fields and great coconut plantations and all the varied cultures that seem to gather in the lowlands of tropical islands, but it was of peculiar interest to me because the first Brazilian rubber trees which succeeded in growing anywhere in the Orient were planted in 1876 in the lowland garden of Henaratgoda, which had been established especially for their reception. I visited the garden, and it was thrilling to see the original grove of a dozen or more trees. Upon them can still be seen the old scars made by those earliest efforts to tap the trees and get rubber from them, timid tappings they were in those days, for the fear of killing the only large rubber trees in the Island was a real one. This was before Dr. H. N. Ridley of Singapore discovered the method of daily tapping which made plantation rubber possible, and which is in use to-day. The long-bearded Singhalese who is said to have done this earliest tapping is still employed in the garden. I could scarcely believe that so great a thing as the automobile tire, the greatest "emergence" in the evolution of social man, it might perhaps be called, centered here. Certainly no history of its beginnings is complete without mention of this little corner of the tropical world, the corner



During the time that these rubber trees at Heneratgoda, sent by Markham from Brazil in 1876, have taken to grow to their present size, the whole vast structure of civilization that rolls on rubber tires has come into existence, and immense areas of jungle have been planted with their seeds.

where the first *Hevea braziliensis* was actually grown as a cultivated tree.

Standing in this same low country garden was a fine specimen of the weeping rubber tree, *Ficus Benjamina,* in which I took a special interest for I had planted one of this species on my place in Southern Florida and if it grew as it does in Henaratgoda I fear it would cover my whole eight acres.

Here too is that mystery palm, the "Coco de Mer" (*Lodoicea sechellarum*) whose place of origin puzzled the botanists of the world for years, for the fruits had been picked up on beaches in widely separated parts of the world. Finally in 1743 it was discovered growing in two of the Seychelle Islands off the coast of Madagascar. Its fruit weighs forty pounds and looks like two coconuts soldered together. It does not attempt to flower before it is thirty, and it takes ten years from the time the fruit sets, or forms, before it is ripe. In other words were I to visit the Seychelles and import a ton of the Coco de Mer fruits (50 fruits to the ton), and establish every one of them in Florida, it would take forty years before we could have any Coco de Mer palms in fruit there, and since each palm is either male or female the chances are that twenty-five of the seeds imported would produce males and be fruitless. This fact explains, I presume, why there are so few palms of this species to be seen anywhere outside of the Seychelle Islands. It also serves to emphasize the fact that centuries may easily pass before a species of plant, even if it be of considerable value, can establish itself or be established by man in some other region than that in which it originally occurs.

There were only six fruits on the single female specimen in the Henaratgoda garden and they were not quite ripe; they lacked four or five years of being ripe, I should say. I did not get any; I went after something easier.

We had learned that there was a mangosteen orchard consisting of a dozen or so trees on the road we were to take in going from Colombo to the mountain town of Kandy, near which is situated the great Botanic Garden of Peradeniya. We started out December 17th on our first real tropical auto ride. It was intensely interesting to at last see a mangosteen orchard, even though a small one, and to handle once more the fruits of this remarkable Malayan species, even if they were green. I was in a paradise of enjoyment. At last we were really starting. The Manchurian contingent had been heard from and was on the way to join us. It was to be a real expedition and we were again on a pinnacle of expectation.

As I got back into the auto Mrs. Fairchild complained of feeling ill. She got rapidly worse as we drove up the mountain side and by the time we reached Kandy was in a serious condition demanding immediate medical assistance. Things had crashed again. I knew just one person in Kandy. I telephoned him at once asking for the name of the best physician, thinking that since this was Kandy, the great health resort of India, there must be a good doctor there. My acquaintance recommended one, but added "he's a Eurasian, a half-caste; I hope your wife will not mind that. There is no European doctor in Kandy now."

I can still see the picture those words made on my brain. A British Colony, the great health resort, the far-advertised and famous mountain resort of round-the-world tourists, Kandy, and no doctor. I have said it once, but I repeat it; unless you have been ill or nursed some loved one who is ill, in a foreign country, you do not know what the civilization of that country is like.

I went in search of the doctor at the Apothecaries Hall, a place with the equipment and appearance of a drug store in the poorest part of Southeast Washington. I was referred to his house, where he met me on the stairs and took me into his little meagerly-equipped office. I recounted the symptoms, wondering whether his reply would land me in that vague country of misdiagnosis from whose bourne few ever return. To my infinite relief, the reply was, "I can tell with my microscope in a few minutes." Then followed a convincing conversation from which I saw that here was a trained diagnostician's mind.

Of the weeks of suspense and anguish that ensued I cannot write without emotion and were it not for the fact that they form a very important part of the picture of Ceylon which I hold in my mind (whether justly or not, who can say), I would pass over all reference to them.

I cabled frantically to specialist physicians in Johns Hopkins and Cleveland. I found a Nursing Home with a pleasant room overlooking the lake, that could be fitted up for her, though only two tin bathtubs made up the bathing equipment of the whole establishment, and earth-closets took the place of water-closets, as they do in the most fashionable hotel in Kandy. I made special arrangements to get milk from a tiny dairy away up in the hills, I searched the town over for an electric fan and had finally to take an old worn out one almost by force from the desk of the garage owner, telling him he could get along without it and could order a new one from Colombo at my expense. It cost me a thousand dollars for consultations; and the consulting doctor from Colombo, a well-trained, capable man, commanding our immediate respect, was a Burgher too.

Of the three nurses of that Nursing Home on whom we particularly depended in those anxious days, one was Irish, one Australian and one English. We learned to have more than a mere fondness for them, we could not help admiring them. Their tales of the conditions under which they had nursed deserve to be chronicled. They told of nursing during the war in corrugated iron huts on the Tigris, with temperatures of 125° F. beating down on the patients, causing several cases of sunstroke among them every day, conditions under which the nurses had to wear their pith helmets indoors as well as out; of palm-thatched shacks on the Fly River and at Port Moresby, New Guinea, where malaria and the filaria diseases abound, and the moisture-saturated atmosphere has a night and day temperature of over ninety. Miss "Australia" was born on a ranch in the very interior of the Australian bush and had seen seasons when, as a child, she had lived mostly on pumpkins. Quick witted, self-reliant and inured to hardships they were, and enjoying the adventurous active life that a membership in the Overseas Nursing Association afforded. They could travel all over the world through this association, staying at least a year in each country they signed up for. It is a pity that some American organization cannot look into these nursing homes scattered over the world and see that they are equipped with more of the comforts and facilities that characterize our own hospitals.

CHAPTER XXII

COLLECTING DAYS IN CEYLON

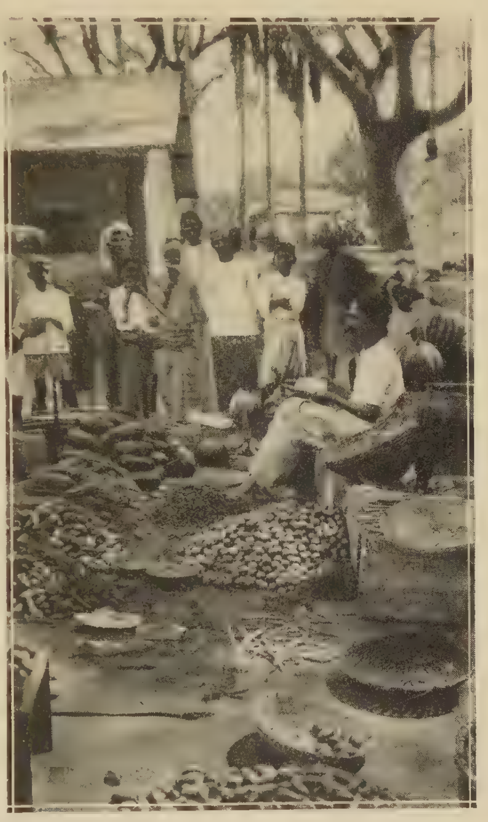
JUST in the nick of time, as the crisis in the disease was approaching, the Manchurian explorers arrived, old and intimate friends, Howard Dorsett and his son Jim. There are times when nothing takes the place of an old friend, and this was one. Our fortunes mended from that day and in three more weeks the patient was about.

It has always struck me as curious that I should have had two experiences with illness in Ceylon. The first was with typhoid, in 1900, when I was the patient and my dear old friend Barbour Lathrop got out his six-shooter and defied the hotel manager, who wanted me taken to the hospital against the doctor's advice, the second, a quarter of a century later, which I have just described. The amazing thing, it seems to me, is how little change for the better has been made in the intervening years. In sanitation, in refrigeration, in medical supervision, in hotel facilities, and in railroad management, Ceylon has remained pretty much where she was, so far as I can judge. Perhaps it is all that one should expect when there are but eight thousand or so white people scattered among so many hundreds of thousands of natives, for these are fields in which the Singhalese and Tamils do not excel.

A loosening of the respect for authority has come with the growth of a Legislative Mixed Assembly in which endless discussions are forever arising, and the Eurasians and native Singhalese are entering many of the government offices. The problem of two races working side by side has not yet been too successfully worked out in Ceylon.

I had not been able to do much during Mrs. Fairchild's illness, but with her convalescence and the arrival of the Manchurian forces with their battery of cameras, the fun began.

We started in where every trained Agricultural Explorer does, at the markets. There is a remarkable one in Kandy. It reflects at once a most significant difference between the races of Ceylon and those of Morocco. It is a vegetarian market, for the Singhalese are most of them Buddhists and eat no flesh of any kind. They antedate the Battle Creek Sanitarium by about a thousand years. They have gone Dr. J. H. Kellogg one better and raised the doctrine of the low protein diet to a religion. If you ask a native what he lives on he will tell you "curry," but what he means by curry, so far as its ingredients are concerned, is about as definite as what the Irishman means when he talks of a "stew." There are, of course, certain necessary things in all curries, the most important of which is the cardamon (*Elettaria cardamomum*) a spice consisting of the small straw-colored dry fruits of a strictly tropical plant, extensively grown in jungle plantations in British India and elsewhere through the Oriental tropics. Cardamons, be-



Some of the hosts of vegetables out of which the Singhalese make their curries.

fore Columbus' time were to the East Indian what red peppers were to the West Indian, the spice of life. To-day the two condiments are mixed and one finds cardamons for sale in Trinidad and the hottest red peppers in the world in Java. Among the ingredients deemed essential to all the curries of Ceylon is also the curry leaf (*Murraya kœningiana*).[1] This curry leaf is a peculiar ingredient for, like our bay leaf, it only gives a flavor. It is boiled with the curry but thrown out of it before serving. I had never before seen it and was struck by the piles of it everywhere. It is always used fresh. I could not find out just what particular flavor this leaf imparted to the Ceylon curry; to me it was indistinguishable among the wealth of flavors, and I can find no reference to its use in Java or Sumatra; I saw it only in Ceylon. With the golden-yellow curry sauce to start with, a Singhalese cook can work into his so-called "curry" a dozen different species of vegetables, but no meat or fish of any kind. When I recall the ceremony connected with the serving of any one of these Oriental curries I cannot understand the grounds for the flippancy with which the average American speaks of a curry or of the rijstaafel of Java. The almost universal ignorance existing in even such subtropical regions as South Florida regarding the makeup of a curry is not a compliment to our intelligence. To refuse to study the table customs and habits of a great civilization which for a thousand years has been working with tropical food materials is not reasonable.

So it was with a feeling of the importance of the subject that we haunted the marketplaces of Ceylon with our hand cameras.

Living in the hotel in Kandy was a very interesting man who took a keen interest in the vegetables of his native country, Dr. Andreas Nell, the best oculist on the island. On several excursions he acted as guide and interpreter and we are indebted to him for many an interesting day as well as for a viewpoint with regard to the foods of Ceylon that we could hardly have obtained in any other way. He went with us to the Sunday

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[1] Now growing in Florida, thanks to Mr. F. A. Lewis of Kandy.

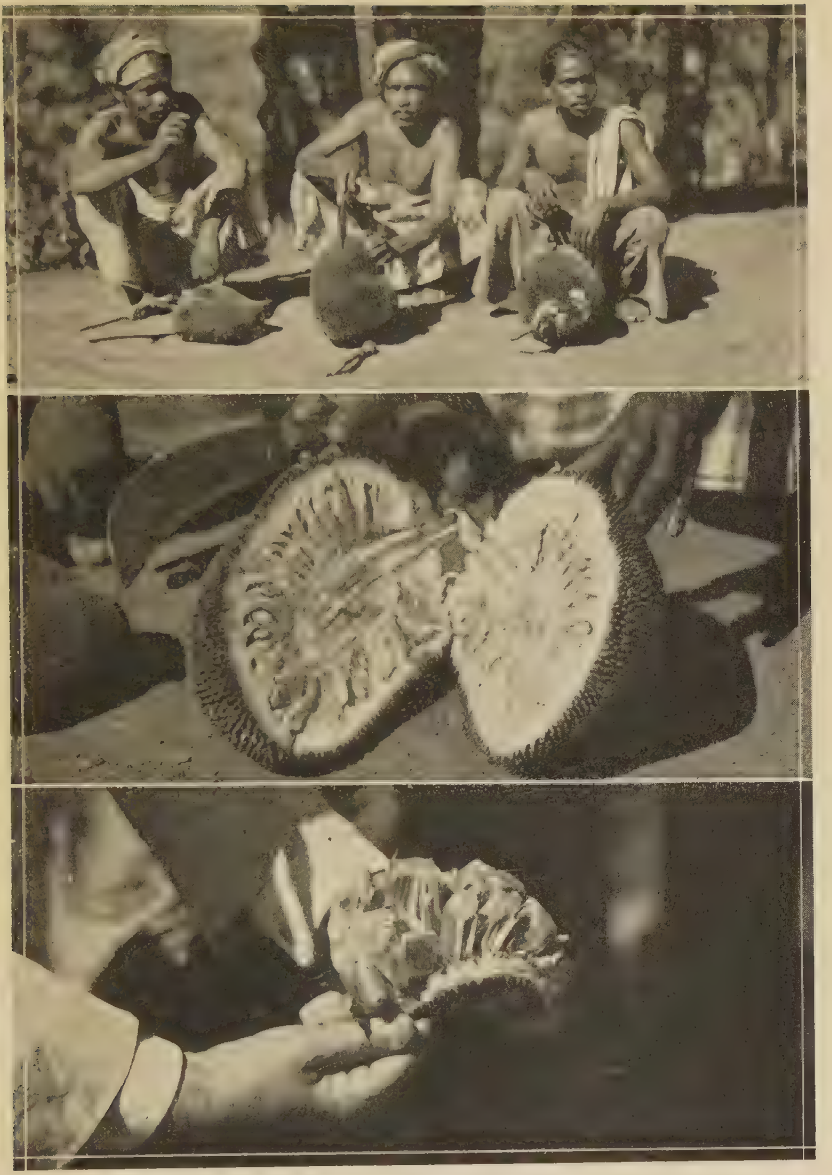
Above—Carriers who have just brought in a basket of betel vine leaves from the plantation. These leaves and the betel palm nuts are the most important ingredients of the betel chew.

Below—Piles of betel nuts are to be seen in every market in Ceylon, just as a tobacco store can be found in every American town.

market at Kadugannawa, a place literally swarming with native marketers. Great piles of cucumbers showed how popular a vegetable this is in the Orient. Pumpkins, sweet potatoes, string beans, snake gourds, okra, and small green peppers, all looked familiar and were inferior to these same vegetables at home. We were struck at once by the great piles of betel nuts everywhere, and the great baskets of fresh leaves of the betel vine (*Piper betel*), in fact these were among the most conspicuous objects in the market, for the Singhalese is certainly a betel-chewing addict.

It was not so long ago that the halls of our own Congress had a cuspidor at every turn, and around each was a zone of tobacco spittle, disgusting even to write about. Here in Ceylon we found a people with an even more unpleasant habit fixed upon them, for betel-chewing turns the saliva blood-red. Behind great piles of betel palm nuts that look much like nutmegs, sat the dealers of betel quids, each with his tool box by his side. He usually had an assistant to pile in neat little tiers on a special stand the fresh broad green leaves as he took them from the bamboo basket that the carriers brought in from the plantations of the betel vine. For the waiting quid buyer he laid a fresh betel leaf on the palm of his hand, sliced a fresh piece from a betel palm nut, laid this, together with a clove, and a shred of tobacco on the shiny leaf and then with his little wooden stick dabbed on one edge of the leaf, much as a mason would trowel plaster, a small quantity of quicklime paste. The purchaser examined the quid, paid for it, reduced the amount of lime with his thumb to what he could stand, folded the leaf over its ingredients and popped the whole thing into his mouth. How long a quid lasts I do not know; I know it did not last long with either Jim or Graham.

As to how deleterious the slight amount of akaloid *arecoline* contained in the palm nut or the oil in the fresh leaf may be, authorities differ. When one thinks of the coca-chewing Indians



Top—There is as much technique required in the preparation of a jackfruit as there is in that of a grapefruit (*Artocarpus integri folia*).

Center—First it is cut in half and then into small segments.

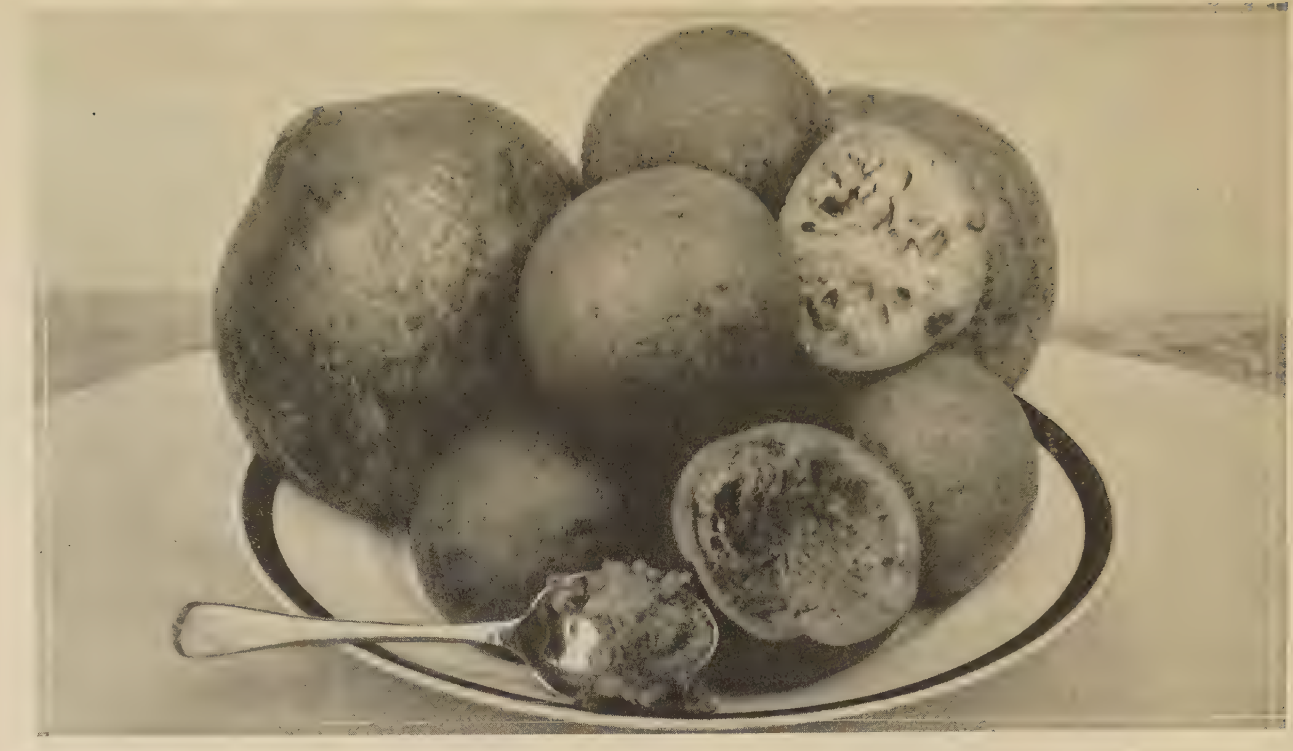
Bottom—The arillus around the seed of the jackfruit has a rich tropical fruit flavor, and the seeds also are eaten, being roasted like chestnuts.

of the Andes, the "chewing stick" West African blacks, the tobacco-chewing races of Europe, the khat-chewing Arabs of Yemen and the gum-chewing addicts of the United States, it would almost seem as though chewing were an instinctive habit, acquired by the race in its prenatal condition, just as the habit of sucking the thumb is now supposed to originate, before, and not after birth.

Every market we visited in Ceylon had its betel sellers and if my memory does not serve me false, the habit seems to be growing. It is a filthy habit and it ought to be possible to substitute chewing-gum. It would certainly be much more convenient and sanitary; but what would become of the betel palm and betel vine industries?

I had seen and heard much of the so-called jack-fruit when I was in the East before, and had even tasted it several times, finding it rather strong, but I was not prepared to find it the universal fruit of the Ceylon markets, nor to hear that during the war the regions of Southern Ceylon, where thousands of the jack-fruit trees grow, had shown themselves independent of the rice shortage, which threatened with starvation the people living in regions where it was not cultivated. It was several times said to me during my stay, that second to the rice plant, the jack-fruit tree was the most important food plant on the Island, and this an island with nearly a million acres of coconut palms in bearing. I did not find this tree in such favor either in Java or Sumatra and cannot but compliment the Forestry Department of Ceylon for the encouragement it is giving to the culture of so remarkable a plant. Its value for timber as well as for food makes it a most valuable tropical species.

Dr. Nell kept talking to us of the superior qualities of the "honey jack." I had never heard that there were distinct varieties of the jack-fruit, although of course such a thing was reasonable, so I naturally wanted very much to taste one. We set out on one of those delightful mornings so common in the high altitudes



The bael fruit of Ceylon was long the favorite breakfast fruit of the Kings of Kandy. It has a flavor and a texture that one soon learns to like, and it is recognized as having peculiar medicinal properties.

of the tropics, and went to the charming country home of the Disawa, a descendant of the Kings of Kandy. His men had in their arms specimens of the honey jack as large as watermelons and even heavier I think. We photographed the men in front of one of the trees from whose great trunk the fruits had been taken, and then we were given a lesson in how to eat them. I was reminded of the time when I heard a German student give a learned discussion on how to eat a banana. He thought his hearers might try to eat the skin. It is a curious fact that there is a special technique connected with the eating of any fruit. If you did not know cucumbers would you eat the seeds or the rind? If you had never seen an orange before would you not try to bite into it? We found that the honey jack had to be cut with a long knife into segments of a convenient size and these had to be opened by bending them back. When one followed directions one found in one's hands an inviting golden-yellow mass, of a rather firm consistency and an extremely rich, sweet flavor, far superior to that of the ordinary jack-fruit. The large seeds, of the size and shape of sugar-coated almonds, are delicious when roasted and are as nutritious as chestnuts. We saved all of the seeds from this fruit and sent them to the Panama Canal Zone and Honduras and Cuba and even to South Florida, where there was already one jack-fruit tree that had borne fruit.

Our host also asked us if we would not join him in his favorite breakfast dish of bael fruit and jaggery. He took up a fruit, struck it on the table as one might a hard-boiled egg and opened it. He sprinkled the brownish pulp with sugar from the jaggery palm and ate it with a spoon. I was delighted. Had not the single bael fruit tree in our little government garden in Miami once fruited, and had I not, amid scorn and derision and utter lack of interest in "the thing," taken one home, eaten it with pleasure, and then made an ash tray out of the hard shell? And now, here I was, watching the last descendant of the Kings of Kandy eat a bael fruit, giving it the stamp of royal approval, as it were, and in so doing continuing the practice of his grandfather, who for thirty years began his day with the eating of a bael fruit, sweetened with jaggery sugar.

Jaggery sugar, by the way, is not just another kind of sugar. It has as distinct a taste as maple sugar, and is quite as delicious, with the aroma of the forest in its flavor. It is one of the few native things that even the conservative British residents of Ceylon deign to eat. Occasionally at the hotel and at the Nursing Home we were given tapioca pudding with coconut milk and jaggery syrup, or a thin pancake with grated coconut and jaggery rolled up in it. Jaggery can be made from the sap of many kinds of palm, but that with the finest flavor comes from the *Caryota urens,* or so-called sago palm, from which, by an ingenious process of tapping, as much as twelve gallons of sweet sap can be extracted in a single day.

I noticed as I ate my bael fruit, which botanically is *Ægle marmelos,* that it had only small rudimentary seeds in it. Evidently there were varieties of it and an excursion to the tree from which these were taken resulted in my getting some bud-sticks of this particular strain. Unfortunately, although I looked that tree over thoroughly I could not for the life of me find a bud-stick that was really good, and those that I did get failed to live. For those who do not know, be it remarked that not any old twig of a citrus or a bael tree makes material from which even the most expert propagator can obtain the variety. The twig must be of vigorous growth and preferably of last year's production, with well-developed buds, and not smaller than a lead pencil. I hope we may yet be able to get this particularly good strain to add to our collection. The bael fruit is not only a delicious fruit, but there are excellent grounds for attributing to it a remarkable medicinal and regulatory quality, which has made it a standard remedy for intestinal disorders.

When I had visited Ceylon before, I had seen a coconut of which the husk was edible, but I never was able to convince my

This Singhalese workman is as fond of the husk of the Nawasi coconut he is holding as a New England farmer is of a crisp raw turnip. The husks of ordinary coconuts are quite inedible, but that of the Nawasi is sweet and palatable.

coconut-growing friends in Florida that I was telling the truth when I recounted the experience. Naturally I was delighted when I found that Dr. Nell and the Disawa knew it perfectly well and were prepared to get some. It is called the Nawasi coconut. We drove to another of the Disawa's country houses, where he keeps his herd of elephants, and were shown one of the Nawasi coconut palms. I noticed a strip from a palm leaf tied around the stem and asked what it was for. "It has been tied there by a sorcerer; nobody dares to climb it," was the reply, and I saw at once that several other palms had the same charms around their stems. The remark was made in a perfectly matter-of-fact manner; evidently the practice was an established one. Coming from a land where such crude superstitions are dying out, it was hard for us to believe that a wisp of palm leaf tied about a palm could deter anyone from climbing the palm if he wanted to, but there the nuts hung and nobody dared to get them, not even the owner of the tree. He finally sent a man to a tree some distance away. The nuts were rather small, but the base or stem end was so tender that I was able to cut it as easily as one would a turnip. We all tasted it and found it sweet and crisp, as one would say, "not bad eating." I was told that this variety comes true to seed. If this is so, then the nuts we sent to the Panama Canal Zone should introduce this variety into the Western tropics.

Under the supervision of Dr. Gadd, the authority on coconut diseases, we also procured the best strains of the king coconut from healthy trees in the interior of the island, and ultimately the State Plant Board may allow these nuts to be brought into Florida. This is not the place for a discussion of the highly controversial question of the parasitism of the coconut bud-rot fungus (*Phytopthera faberi*). Under the conditions prevailing in Ceylon it can be said that the bud-rot of the coconut is a thing of very minor importance. It is pretty generally distributed over the island and had it possessed the power to wipe out the million or so acres of coconuts it must certainly have done so in the long period of time it has existed in that island. I am in the above statement reflecting the opinion of Dr. Gadd of the Department of Agriculture in Peradeniya, who has made a thorough study of the disease.

I find myself overwhelmed when I attempt to describe the Peradeniya Botanic Gardens, where we spent many delightful days collecting seeds and plant material of all kinds from the wealth of tropical trees and shrubs that have been gathered into it. Like most tropical botanic gardens it is essentially an arboretum, that is, the available space is taken up mostly with trees, shrubs, or palms; there are few annual plants in it.

It is to the everlasting credit of the British leaders of the 19th century, whoever they were, that such a garden should have been attempted. Ceylon in 1821 was farther away in point of time from London than is any spot on the world to-day, yet they thought of a botanic garden as something necessary for the development of the colony, and they went about it with the same care they would have given a Royal Garden in England. They designed the grassy places and laid out the drives and arranged the borders just as they would have done at home. It stands to-day as a remarkable example of English landscape gardening in the tropics, and although it is possible that some day a truly tropical style of landscape gardening may be developed, one that will not depend on lawns and avenues, until that day comes Peradeniya will stand as one of the greatest in the world.

When I think of the great length of time it has taken my own country to arrive at an appreciation of the importance of such gardens, I feel myself in no position to utter a word of criticism; I can only appeal for the enlargement of this arboretum, as indeed of all others wherever established. Peradeniya had only 150 acres of mountain land to begin with, and although this is now being increased, the failure to start with a large enough area is apparent, as it is already crowded to overflowing. If one were to offer a hundred species of forest trees from the Cameroon or Brazil I feel sure it would embarrass the curator, for where could he find places to plant them? When I stood in the so-called Guttiferæ quarter of the gardens and tried to check up my Garcinia list made in the herbaria of Kew, Leyden, Paris and Geneva, I began to realize how utterly fragmentary the collection is.

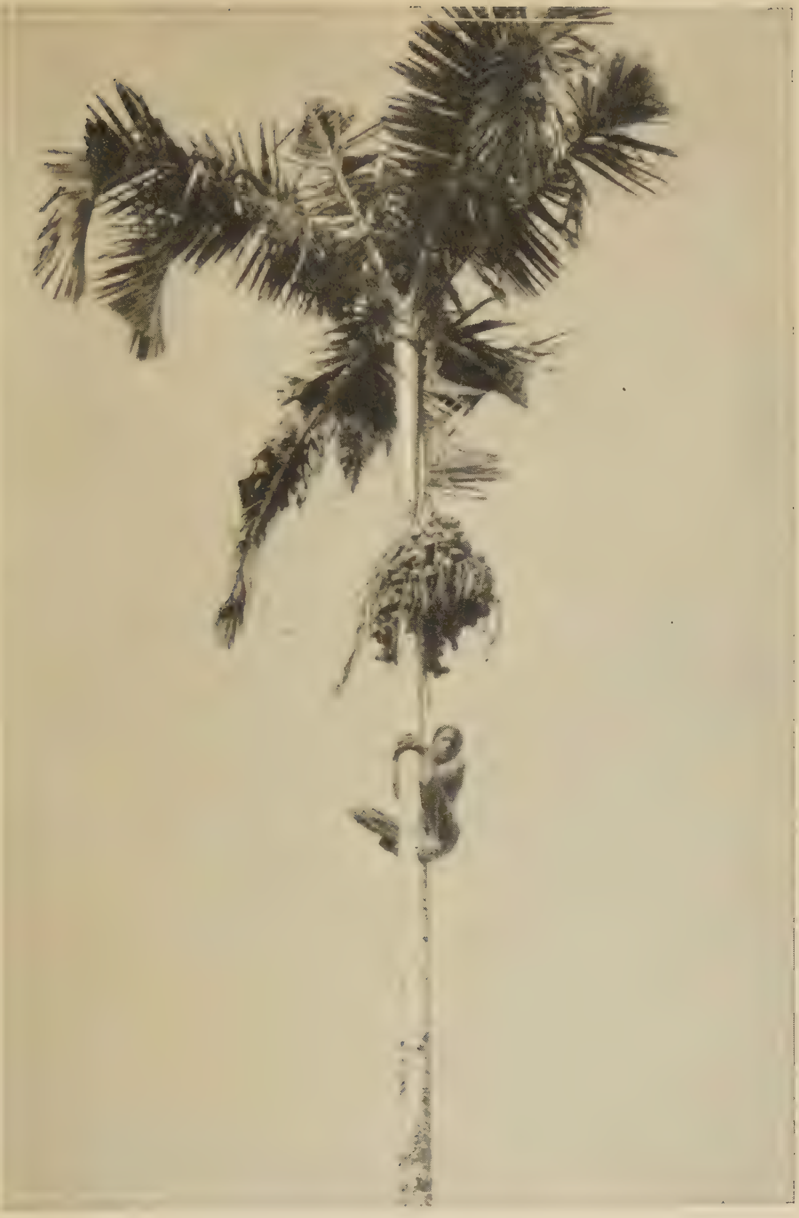
There were growing the Cochin China species *Garcinia ferrea* and *Garcinia cochinchinensis;* the species *Garcinia cornea* that occurs from Eastern Bengal to the Malay Archipelago, with small fruits which Mr. Parsons informed me were acid but quite good eating; the Singhalese "kana-goraka" (*Garcinia morella*) with a fruit about the size of a morello cherry, that is scarcely edible, but is known to the Singhalese because of the sticky gamboge-like sap of the tree which is a favorite medicament for wounds; and the true "goraka" (*Garcinia cambogia*) of which the dull black dried segments are offered on the markets everywhere. These segments are as sour as hydrochloric acid and are used, one piece at a time, to give to the curry a pleasant acid taste. They are one of the flavoring elements which give to the Singhalese curry its character.

To include anything approaching a complete collection of garcinias would take at least twelve acres, while to accommodate the palms of the world would take over forty acres, were they planted as closely as fruit trees, twenty-five feet apart. The really comprehensive arboretum that shall attempt to gather in the thousands of arborescent species of the whole tropical world remains yet to be attempted. When it does come, if it ever does, it will cover several thousand acres of land and be one of the great wonders of man's achievement.

I had visited Peradeniya just after the great Dr. Trimen passed away, in 1896, again in 1899 when Dr. Willis was its Director, and in 1902 before he left, after he had built up a really remarkable staff of men interested in every phase of tropical plant life. To-day, while on every hand there were signs of enlargement, wonderfully equipped laboratories and good office buildings, there were unmistakable signs of what might be called democratization. Undergraduate Eurasians and assistants were in evidence and I failed to find the spirit of investigation so characteristic of the Peradeniya of the old days. This change is probably an inevitable result of the attempt to accomplish what are known as "practical results." With the growth of a Department of Agriculture there has come the overshadowing of the Botanic Garden, and this, combined with the lack of new land in which to plant, has led, I should judge, to a cessation in the introduction of new species of trees and plants from other regions of the earth. Without land over which to spread, such an institution cannot become greater with age. It simply becomes older, and differs from the young garden in the age of the plantings. Peradeniya needs more land for its permanent plantings.

We found it a wonderful place to botanize in. Dr. Stockdale, the director, gave us carte blanche in the matter of collecting; the curator, Mr. Parsons, overworked with the details of the Department, gave us as much of his time as he could spare and allowed us to clean and pack our seeds in his potting room, and arranged the packing of several wardian cases that we later took with us to America. While theoretically, it should be a simple matter to get from Peradeniya anything in the way of seeds or plants the authorities are willing to send, practically one has to arrange the packing and shipping details with a great deal more care than the native help at such gardens could give. There is the very serious matter of inspecting one's material, a matter that cannot of course be left to others who are not aware of the dangers. The microscope has to be brought into play continually if one does not wish his material thrown into the discard when it reaches the Plant Quarantine office in Washington.

With the great influx of people into Florida has come such a desire for palms as in my wildest imaginings of the nineties I could not have appreciated. This demand is particularly hard to satisfy because of the difficulties of shipping palm seeds. The majority of palm seeds, although very hard, have only very tiny and delicate embryos that are usually boxed in very small cavities at the blossom end of the seed. The seed itself may remain perfectly solid for a dozen years and to all appearances be viable, but a look with a lens at the tiny embryo may easily reveal the fact that the little thing has been dead for years. To transport a palm seed ten thousand miles through the tropics and have it live is not by any means always an easy thing to do. We took the greatest pains to remove all of the juicy or oily pulp surrounding the seeds, then let the seeds dry in the shade for a day or two, not longer, and then, if they were large, we wrapped each seed in a bit of oiled paper as though it were a bit of taffy, twisting the ends. We did this so that if one molded it would not infect the others. If they were small, several would go in each packet. Next we would prepare a lot of ground peat (one has to carry this along for it is not obtainable in the tropics) by moistening it very slightly, then pack layer upon layer alternately of peat and

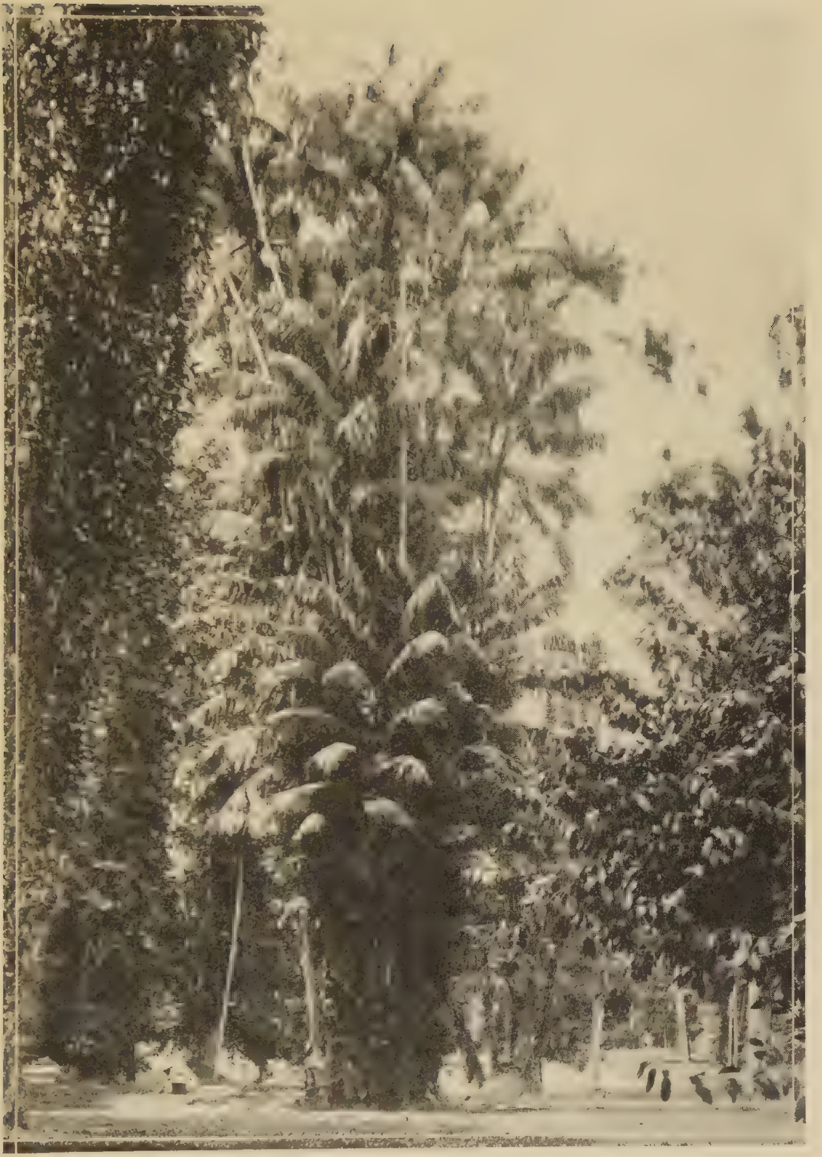


The way to get palm seeds in Ceylon is to send a boy up the tree. *Rhopaloblaste Singaporensis* is one of the most graceful of the palms and peculiarly suited for dooryards because of its slender habit.

wrapped palm kernels in a special mailing tin. Generally we had several tins to send at once, so we would sew them up tightly in a piece of cotton cloth, writing the address on it with India ink. In this work we had to combat our natural tendency to economize on postage and send our seeds by parcel post instead of letter mail. It took us some time to realize that with many seeds the vitality was often a matter of days, and that by saving on stamps we stood a good chance of losing material we had come half-way around the world to collect. Our policy as it worked out finally was to get the seeds, clean them at once, pack them as soon as possible and get them into the letter post. Had air mail been possible, we should have used it.

Collecting palm seeds, even in a botanic garden, is a little like getting down the flag from the top of the flag pole when the hoisting tackle refuses to work. Some of the handsomest of the palms in Peradeniya are sixty feet high and not more than six inches through at the base, slender living flag poles with marvelous green plumes at the tip, under which hang the clusters of fruits. They are inconceivably graceful, and the more you see of them the more you realize how incomparably beautiful they are. But were you given the task of collecting those fruits that hang under the crown of leaves you would have to give it up or do as we did, hire a Singhalese boy to climb up and get them.

As the sun was coming up over the tops of the great forest trees that surround the garden, we used to go to the palm collection and feast our eyes on the graceful forms there. The great shaggy wine palm of West Africa (*Raphia vinifera*) with fruit clusters two yards long, the Katu-Kitul (*Oncosperma fasciculatum*), a cluster palm with thirty or so slender stems rising in a group sixty feet into the air, yet with no stem more than eight inches through at the base; the Assai palm of tropical America (*Euterpe edulis*), slender as a flag pole, with drooping pinnate leaves hanging gracefully from the tip; a Singapore palm (*Rhopaloblaste singaporensis*) ideal for small yards because, although



Oncosperma fasciculatum is a giant cluster palm whose stems rise sixty feet into the air, and yet are only six inches in diameter. The author, collecting seeds, Peradeniya Gardens, Ceylon, gives the scale.

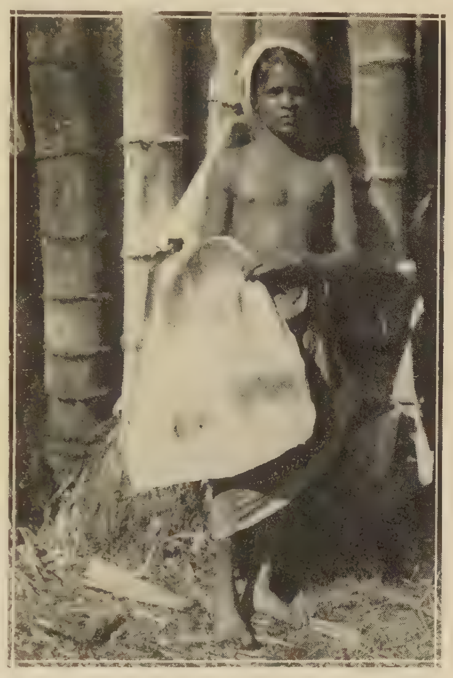
it rises far above the roof, it takes up so little ground room; another equally suited for small gardens, from Australia (*Ptychosperma angustifolia*) and even more graceful, the *Areca triandra* from Burma, a rival of the common betel palm. I think I lost my heart most completely, however, to an incomparable species from the Moluccas (*Calyptrocalyx spicatus*), and I hoped to get bushels of seeds of it when we reached that part of the world and with them beautify the landscapes of South Florida. Of the sealing-wax palm I will treat in a later chapter.

The gigantic Talipot palm (*Corypha umbraculifera*) is the most overpowering piece of vegetation in the garden. I have never seen anything that compares with it in stateliness when it is in flower, with its immense rugged pillar of a stem seventy feet tall, its gigantic fan-like leaves thirteen feet long in a great mass at the top, and above these a dome of white flowers weighing two tons. To me it is the master of the world of palms.

Of the famous cabbage palm avenue (*Oreodoxya oleracea*) I felt more critical, for it seemed to me the palms were less perfect as individuals than some avenues of *Oreodoxya regia* I had seen in Florida, but I was glad to see the Palmyras (*Borassus flabellifer*), I had forgotten their beauty and also their likeness to our native Florida cabbage palmetto (*Inodes palmetto*); in fact they struck me as glorified cabbage palmettos which should by all means be made a feature of our southern landscapes.

The great Burmese giant bamboo (*Dendrocalamus giganteus*) which seems to impress tourists as the greatest thing in the garden, I looked at after a lapse of twenty-five years with special interest, since in the interim, we of the Office of Plant Introduction had gone into the bamboo-introduction game. The clump in the garden is amazing. You do not appreciate its remarkable character until you are standing with one hand on a hollow stem almost a foot through and holding in the other, one of the great stem sheathes as large as a drain board and as thick as a piece of heavy cardboard. You look up a hundred and twenty feet, along the hollow stem you have your hand on, and see no sign of a branch for seventy-five feet, just the smooth green stem that is jointed, like a grass, all the way up to the slender leafy tip waving in the breeze. You feel like a Lilliputian in a bunch of meadow grass. This gigantic clump has come into existence since I last visited the gardens. The old clump, together with all the other magnificent clumps of the same species in the Island, all fruited at the same time and died down to the ground in a single season, and the magnificent growth we saw has come up again from seed.

It is a great mistake to think that all tropical peoples have learned the extensive use of the bamboo; in Ceylon for example, it is very little used. As a matter of fact, in most tropical countries there are no truly useful species, and in only a few places are they really cultivated. Much remains to be done in this field of plant introduction.

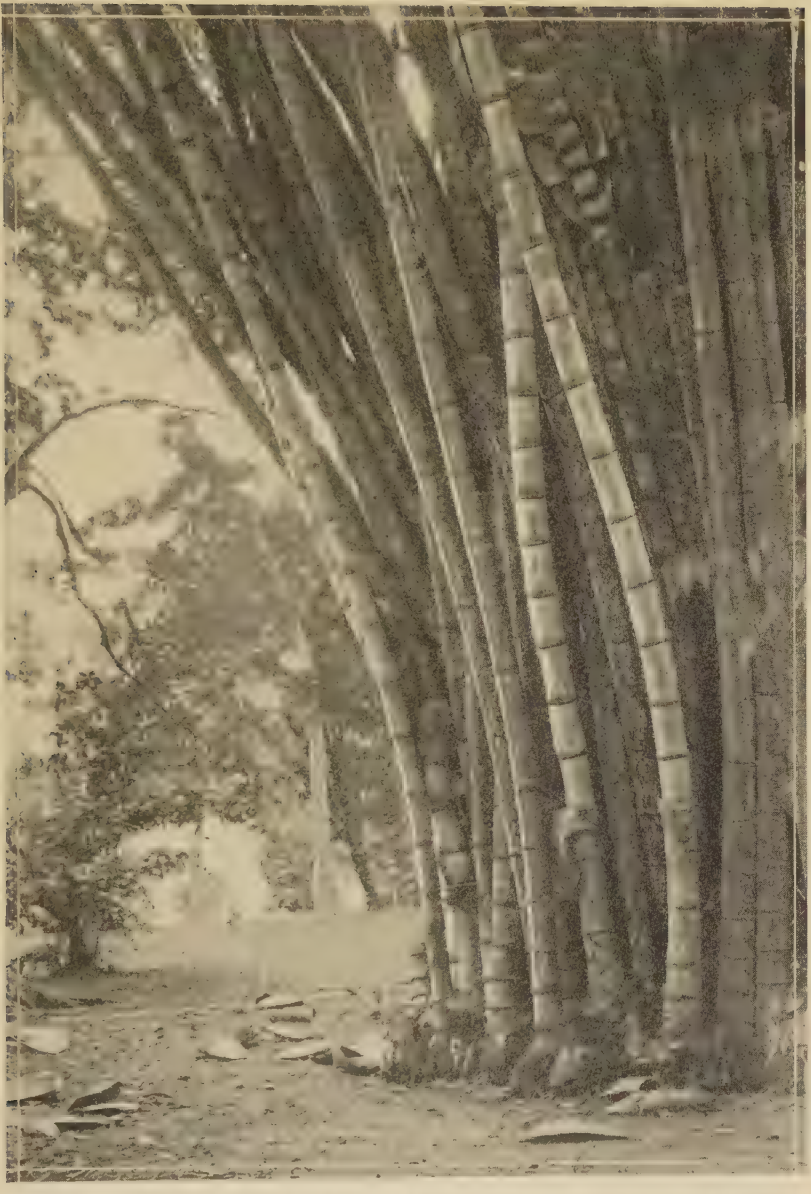

The giant bamboo of Burma has stems so large that their sheaths look like broad boards.

Dorsett took a great fancy to the avenue of cannonball trees (*Courapita Guianensis*) and I cannot blame him, for of all weird methods of fruiting, this tree has the weirdest. It sends out a mass of short fruiting branches, a perfect mass of them, from the trunk, far below the normal leafy branches, and on these bears its great orchid-like flowers and big round fruits.

He and Jim took photographs of everything, and thanks to the privilege of using Dr. Hutson's Entomological Laboratory, they were able to develop their pictures every night. They had come fresh from Northern Manchurian landscapes, where the forms of vegetation one sees on the ground glass of the camera are not so strikingly different from those at home, and when they looked through their finders at a bamboo stem eight inches through, or at a coolie fifty feet above them hugging a palm stem to keep from falling, or cannonballs in clusters on trees, or perfectly straight tree trunks with crowns as large as those of an oak, but composed of only a few dozen big leaves instead of millions of tiny ones, they could not resist "shooting" them.

Wherever we went in the gardens we heard the chattering and squealing of the flying foxes. One particular tree had been chosen by them for a roost. Like ravens, they came and went at sunset and sunrise. One cannot like them exactly; who does like bats? I remember one evening when Mrs. Fairchild was able to be out on the verandah of the Nursing Home, we sat there watching the quick drop of the sun behind the jungle trees. Soon, against the gold and red of the sky, troops of these giant bats appeared. There seemed an endless stream of them, flying toward the darker part of the sky. We estimated ten thousand of them and when nightfall shut them from view they seemed to be still coming from the West. They are the great fruit pests of the Orient, and Heaven forbid that they should ever get a foothold in the West Indies for they ravage the fruit orchards of Ceylon and Java.

Although I have not found it is easy to get people to eat new vegetables and am often laughed at for even trying to do so, I cannot deny having a special interest in them myself. As we rode through the town of Peradeniya one day my eye caught a large mass of white flowers hanging in a little shopkeeper's door, and as I realized that the shopkeeper was not a florist, I stopped to inquire, and found that these great ivory white blossoms were to eat. They were flowers from a leguminous tree, *Agati grandi-*



The amazing size and grace of the Burmese giant bamboo (*Dendrocalamus giganteus*) must be seen to be appreciated. A clump in the Peradeniya Gardens.

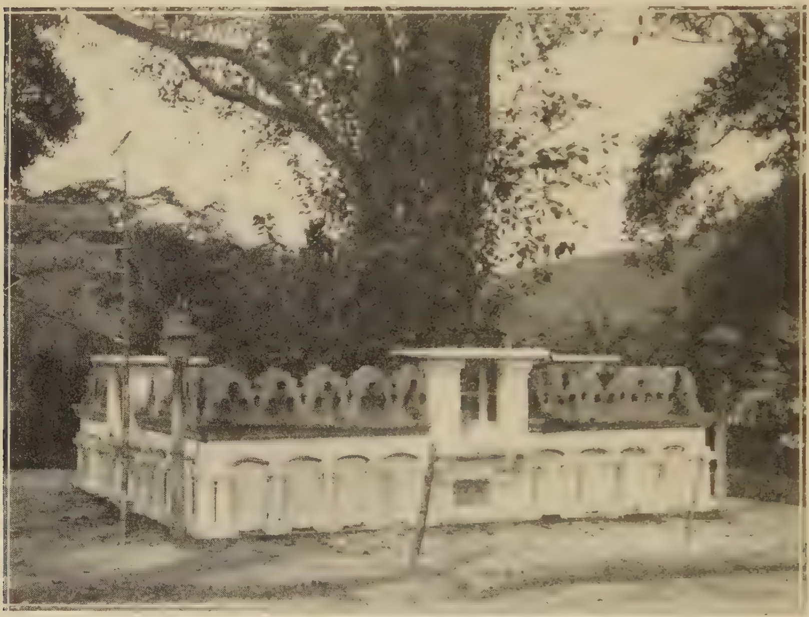
flora. The shopkeeper took me into his small plantation, overlooking the river, where I found his two little daughters picking the agati blossoms for market. The flowers seemed too pretty for use as a vegetable, yet here was a plantation of an acre or more. As we were busy photographing the agati and its little gatherers, the owner pointed to another specialty of his, *Talinum triangulare,* seeds of which we had introduced years ago from Java, and which was growing in my yard in Coconut Grove, Florida.

I later saw this same species growing wild in the cleared lands around a village on the Gold Coast. Coming home in 1928, what was my delight to find that the Garden Club of South Florida had taken up the culture of talinum, finding that in the summer when green vegetables are scarce it makes a delicate "spinach" for the table. Of the seeds of agati I got from the Singhalese grower, some were planted at Chapman Field, Florida, and I have had the pleasure of seeing the small trees in bloom there. I trust the ladies of Florida, than whom there are no more progressive or intelligent experimenters with new vegetables in the world, will do with this new immigrant agati what they have already done with the talinum.

The experiment station idea which, I think, dates back to Rothamstead in England but has had its greatest development in America, has spread to the outermost places in the world. Connected with the Botanic Garden, as a coördinated branch of the Department of Agriculture, is an Experiment Station, and naturally enough we gravitated toward it to see what was being experimented with. By far the most interesting thing we were shown there was the collection of so-called cover crop plants, plants usually belonging to the pea family and of very rapid growth. They not only cover the surface of the ground with stems and leaves that in dying and decaying make considerable humus, but the thousands of underground roots carry nodules filled with nitrogen-gathering bacteria that enrich the soil, and at the same time help greatly in preventing erosion. Tropical islands such as

Little children gathering the flowers of the agati (*Agati grandiflora*) in Ceylon, where it has become a favorite vegetable. Its large petals and tender leaves are eaten fried or as a constituent of the universal curry. Trees of the agati are flowering in South Florida.

Ceylon, before the advent of the tea shrub and the rubber tree, were thickly covered with dense jungles reaching far up the slopes of the mountains. There was little washing away of the soil in those days, but now the slopes are cultivated, the jungles have disappeared, and erosion has become one of the serious problems of plantation management, so that the finding of the best possible cover crop has been one of the most pressing tasks of the Experiment Stations. Although Florida is too flat to ever have much of an erosion problem, cover crops are just as much a desideratum as in Ceylon, particularly in the highly calcareous regions of the East Coast where the soils are lacking in humus, and for this reason, if for no other, we were much interested in the plots of



The Bo tree of India (*Ficus religiosa*) is sacred in every Bhuddist country as being the tree under which the Master meditated. In Ceylon it is often surrounded by a shrine where little oil lamps twinkle in their niches every night.

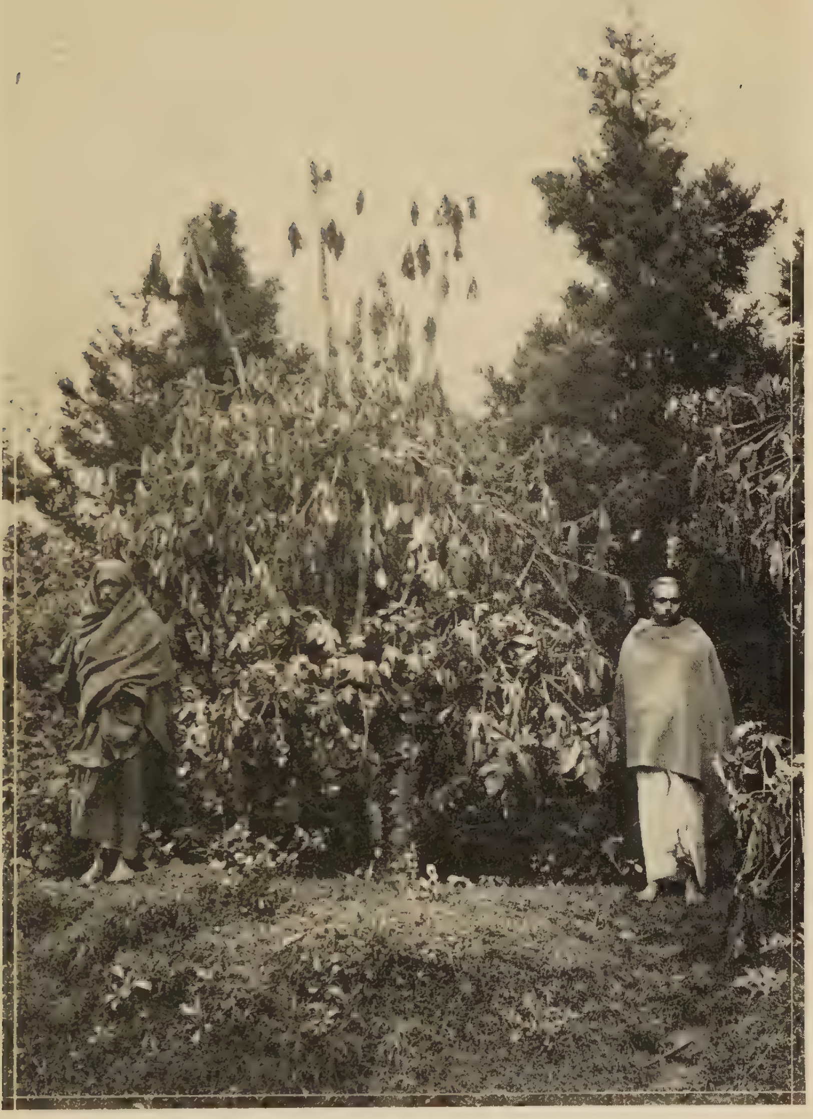
tropical legumes of amazingly rapid growth, covering the ground they were planted on with dense deep masses of leaves. It was interesting later on to see the same species being grown for the same purposes in the Experiment Station in Java and still later to find the hardier of them covering patches of the rocky land in Chapman Field, our Plant Introduction Garden in South Florida, grown from seed we sent in from both these islands. One of these, a terribly spiny sensitive plant (*Mimosa invisa*), said to be the most amazing humus producer in Java, where they use it to smother the jungle vegetation, grew with such a fury in Chapman Field that I became afraid of it and poured a quart of gasoline on it and burned it up completely. It is not enough to guard yourself in the field against miscellaneous plants that might become weeds, one must watch them for several years after they reach America before they become widely disseminated.

CHAPTER XXIII

NEWARA ELIYA AND JAFFNA

We could not be in Ceylon without visiting the famous resort of Newara Eliya, especially as there is a mountain garden near by, at Hakgala, that we wanted to see. We had been so long at Kandy that it was impossible to believe that just a couple of hours' ride above us it could be cold, yet very soon we ran into clouds and mist on the hairpin turns, and Jim and Graham, in their white ducks, began to wonder if they had been right in scoffing at the idea of taking warmer clothing, as we pulled into the cheerless hotel in a cold drizzle. Mountain peaks in the tropics, or places more than 3000 feet high, are curious places psychologically, I think. Coming up from the hot, muggy, low country, the relief from the heat and moisture is at first perfectly delightful, but after a few days, there is something curiously restless and unsatisfying about everything. You dislike the gray chilly mornings and long for the tropical sunrises. There is little that suggests the cool weather of northern latitudes; the mountains under the equator are no substitute at all for the temperate zone. My experience with them is that they are cheerless for a long stay.

I had heard that there were frosts in Ceylon and so I was delighted to run into one and have a chance to study its effects. As we left the hotel at Newara Eliya, we passed into a little valley near the little village of Maregastota. It was morning and we were all shivering with the cold. By the side of the road I saw for the first time a large mountain papaya tree (*Carica candamarcensis*), its leaves all showing that characteristic attitude familiar to Floridians who have had their backyard papayas killed by frost; that distinct dish-rag-on-a-stick appearance. As we got



Frost often occurs in the mountains of Ceylon, and the mountain papaya (*Carica candamarcensis*) was severely injured near Hakgala while we were there.

out to look at it, some mountaineers came out of their huts, wrapped in blankets; even their heads were swathed. It had evidently been a fairly severe freeze, for this mountain papaya comes originally from the high altitudes of South America and is much hardier than the strictly tropical one we grow in South Florida (*Carica papaya*). On looking about we saw that a banana plant had been badly scorched and that the young shoots, the so-called "flush," on the dwarf tea bushes in the plantation near by were black. We felt quite in our element photographing the effects of this freeze, for in 1917 I made an album of photographs of the frosted foliage left by the great freeze of that year in Florida. I could get no records of temperature here, but I should imagine the thermometer had dropped a night or two before to at least 26° F. One might say that Ceylon is not a frost-free island, but neither is Sumatra or Java or Jamaica or Borneo, for that matter.

The courteous superintendent of Hakgala, Mr. Noak, is the third generation of Scotch gardeners to have charge of this delightful place, with its superb fern valley and rock garden. Of course it rained; it usually does rain there, Mrs. Noak said, sometimes for such long spells that in order to get a glimpse of sunshine she would often go down the road a mile or so to get below the clouds. As she spoke, we could see that the sun seemed to be shining below us.

There are doubtless many things in this garden which it would be worth while trying to grow in the mountains of other islands; such superb climbers as *Thunbergia coccinea* and *Thunbergia wightiana* are examples. I was interested particularly in a collection of the Australian she-oaks or casuarinas which were growing in the back garden, and of which Mr. Noak kindly gave us some seeds for South Florida trials. To me there has always been something melancholy in the high mountain landscapes of the moist tropics. I think the fact that everything is covered with lichens and mosses and epiphytes contributes to its dreariness.

During these trips my interest in other things had not made me forget the quest of the mangosteen and its relatives. I made an excursion to see the orchard of Mr. Wright, to which I have already alluded, and found that it had not been increased in size, although the trees had become larger and produced more fruit. Also Dr. Stockdale directed us to what is probably the largest orchard of mangosteens in the island. It had, I think, about forty or fifty trees in it, and was located in a small valley in the mountains above Kandy. We got lost and were drenched with rain in trying to find it, and when we finally did succeed, the owner could not be found. From American standards it would hardly be classed as an orchard. The trees and the young fruit did not appear to vary from the trees and fruits in the Peradeniya Gardens.

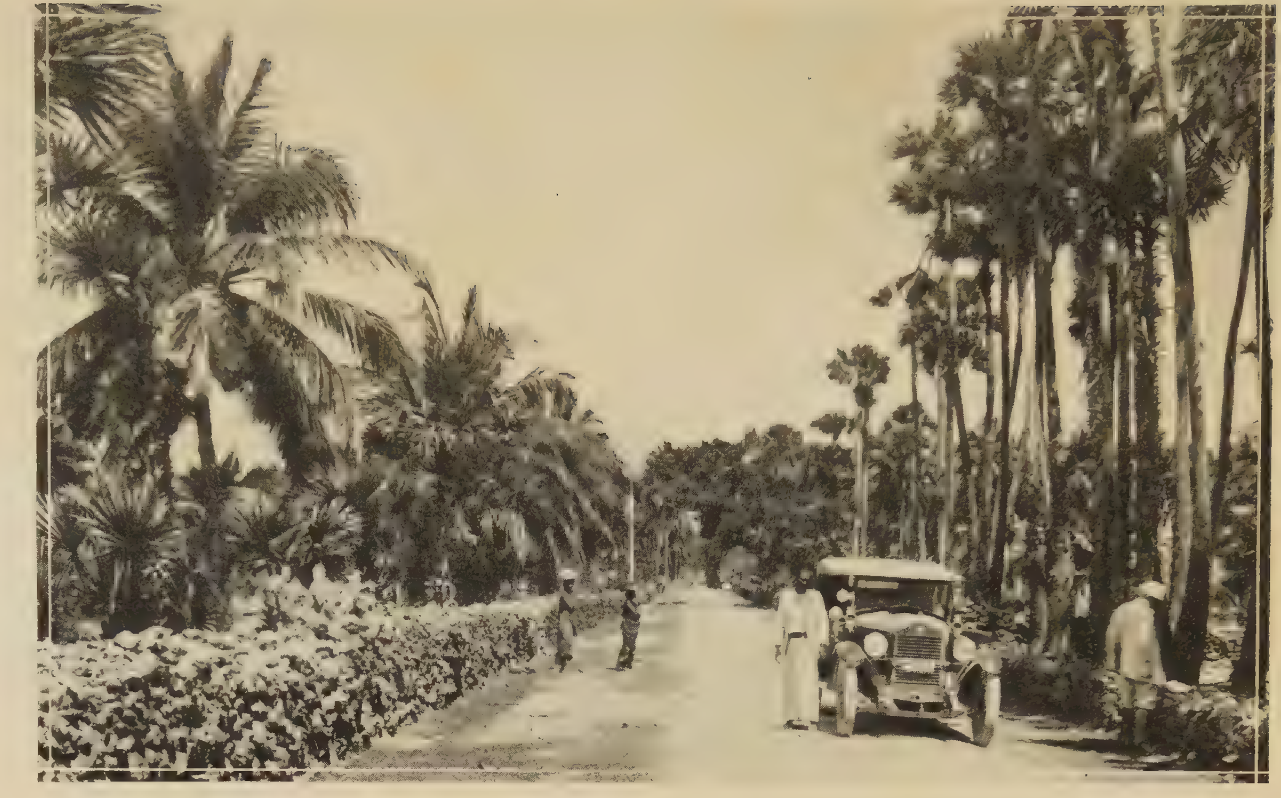
While the collecting was going on in Ceylon in preparation for the arrival of the Utowana, things had gone badly in Naples. The engine parts arrived from Sweden and a second start was made, but other troubles developed between Naples and Suez. Loath to give up, however, Mr. Armour pushed on down through the Red Sea, but the trouble increased, and he finally decided it would not be safe to undertake the long drive through the Indian Ocean, particularly as once it were crossed he would be out of reach of shops capable of repairing the yacht's Diesel engines. Putting in to Aden, he left the yacht, and with Mr. and Mrs. Whitehouse and Dr. Lawler boarded the first available steamer for Ceylon with the idea of arranging for the continuance of the Expedition without the Utowana. Old yachtsman that he was, he could change his plans, as he had done so many times before. The giving up of the Moluccas as the objective of the trip was a keen disappointment to us all, but there was no alternative. After a conference in Kandy and a few delightful days in which Mrs. Fairchild was fortunately able to join, they returned to Aden, and slowly made their way back to Naples.

Before he left, Mr. Armour authorized a land expedition to include Sumatra and Java and cabled to the yacht for all the supplies necessary for the collecting we expected to do, and we began at once to prepare to push on.

There was one place in Ceylon I wanted particularly to visit, and that was Jaffna, at the extreme northern end of the island. I had heard that the soil there was sandy and the rocks were of coral, which made me think conditions might be similar to those in Florida. I have always considered the red clay soil one finds nearly everywhere in the tropics to be one of the drawbacks to life there. So much of the time these soils are wet and muddy, and during the dry season they turn to a fine red dust that is equally disagreeable.

To save time we took a night train. Trains in Ceylon are not very clean nor are the fares low. Four cents a mile I figured them out to be, which is fifty per cent above what one pays on good trains in America. They are run by the government, as are nearly all public utilities in Ceylon, and, since the increase of native control in the legislative affairs of the country, they are, I think, less well run than formerly. To an American the question occurs frequently as to whether the public utilities would not have been better administered by private enterprise as in America, but perhaps they could not be made to pay.

As the dawn broke and we looked out from our berths, Dorsett called out: "Fort Lauderdale, here we are in South Florida." True enough, there were the coral rock walls and the sandy soil, and most like Florida of all, the same curiously exhilarating air that seems to go with a calcareous soil. It is hard to give an idea of the delightfulness of the change that came over all of us. How much the association with Florida had to do with it I cannot say, but it will be hard to convince any of us that there is any climate in the tropics so cheerful as that around the coral reefs and sandy lands of the coast of the Jaffna Peninsula. In talking later to Mrs. Lushington, the wife of the Deputy Conservator of Forests, we were glad to have her confirm this impression. Most of the British women find life in the lowlands of the tropics extremely

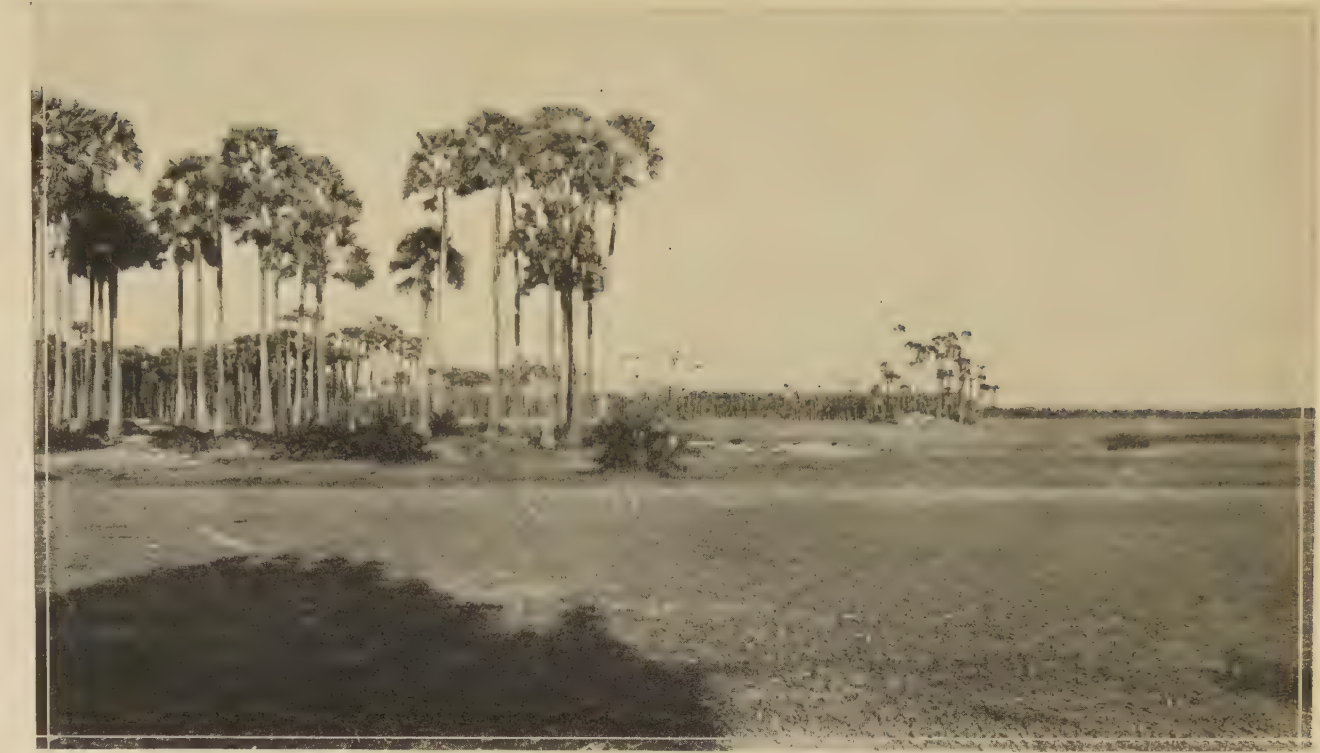


The coral rock walls and white roads; the coconut and the palmyra palms, which look like cabbage palmettos, combine to make the landscapes of Jaffna strikingly similar to those of South Florida.

trying, but she adored it in Jaffna and felt that there was something lifting and cheerful about the climate which one does not find usually in the lowlands.

Mr. Lushington afforded us every assistance in his power and told us where to go to see the finest palmyra palms. This palm, one of seven species composing the genus borassus, reminds one, as I have said, of the cabbage palm of South Florida (*Inodes palmetto*), although it is in no way related to it. If one would see it in its glory, one must go to Jaffna or to some other dry region of the tropics, for in the wetter zone it does not drop its leaf bases so quickly, and has a ragged look. Like the coconut and the date palms, it is one whose "uses are legion," as the old botanical books were wont to remark. According to Willis, an old Tamil song enumerates 801 uses.

It was Sunday morning and as we strolled through the palm thatched village, the Tamils came lazily out from their huts to see what the strangers were doing, and we were soon deep in a discussion of palmyra palm and in particular the methods of its propagation, as we had come up prepared to get a quantity of seeds. If you should ask a man in the street of a country town in Kentucky how apples were propagated, it is an even chance that he would shrug his shoulders and refer you to a nursery. He would not know. In a Tamil village every soul knows how the palmyra palm is grown, for there beside his house is a bed of the germinating seeds and he is as familiar with the taste of a sprouted palmyra seed as you are with that of a roasted chestnut. We were led to one of these seed beds. It was simply a spot where the soil had been loosened to a depth of several feet so that the palm nuts, which are as large as one's fist, can send down unhindered the peculiar root-like sinkers with which they bury their young plantlets deep below the dry surface of the soil. The children began digging out the sprouted seeds and holding them up. These sinkers, which are morphologically hypocotyls, are as much as two feet long. The children tore them open and

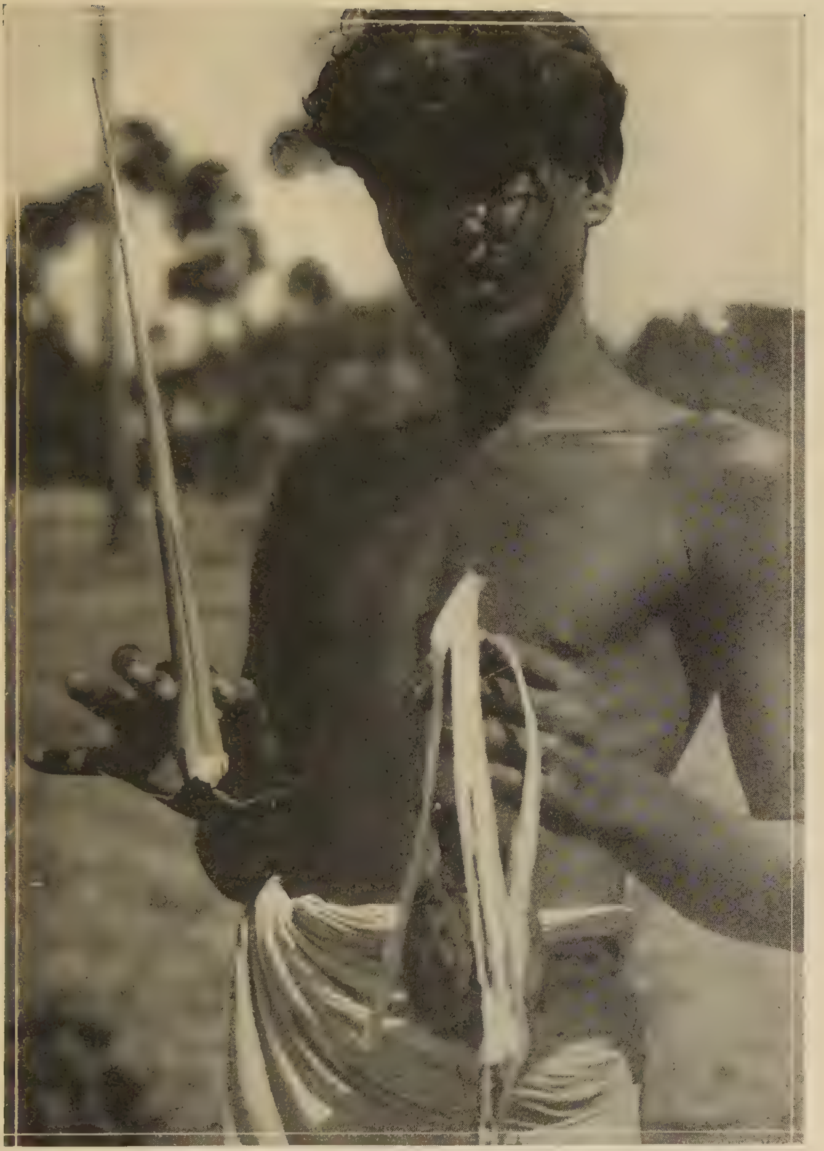


The groves of magnificent palmyra palms (*Borassus flabellifer*) at Jaffna, Ceylon, are more beautiful than the handsomest cabbage palm patches of Florida.

showed inside each a special sheath containing a slender cone-shaped plantlet a foot or so long. This straw-colored plantlet is considered a delicacy among the Tamils, who eat it roasted whole or ground into flour and cooked. We tried it a number of times but decided it was a rather indifferent vegetable, at least as prepared by the Tamils.

After digging up several of these seed beds we were disappointed to find we were too late to buy seeds for shipment to America, as they had all sprouted. The more we saw of the palms, the more we admired their graceful stems and the great bunches of fan-shaped leaves crowning their summits. They are very slow growers and we had to search for some time before we could find any really young ones, sticking their single sword-shaped leaves out of the ground in the curious way they have. A seven-year-old palm is not over ten feet high and when young it has the same ragged appearance that the cabbage palm has, but when it once acquires age, it is as stately as almost any palm I know, topping our cabbage palms by twenty feet and more. The fact that it loves sandy beach conditions makes me very hopeful that it can be grown in large numbers throughout South Florida. It furnishes a delicate jaggery or palm sugar; its strong large leaves make wonderful windbreaks and temporary fences, floor mats, baskets, waterbuckets, hats and even writing paper. From its trunks are made the most ornamental and beautiful rafters and roofing timbers I have ever seen, black with a yellow grain and of a remarkable durability. The fruits are golden yellow with a very fibrous pulp that makes a good jelly, and the kernel also is edible, quite resembling a coconut in flavor.

While many of the 801 uses of the palmyra palm have vanished with the coming of manufactured things, its use on the sand dunes of tropical islands in the Western Hemisphere has not yet begun. When I consider how the coconut palm has become the greatest real estate asset of a vast region of my country, I cannot but dream that this other superb palm will sooner or later

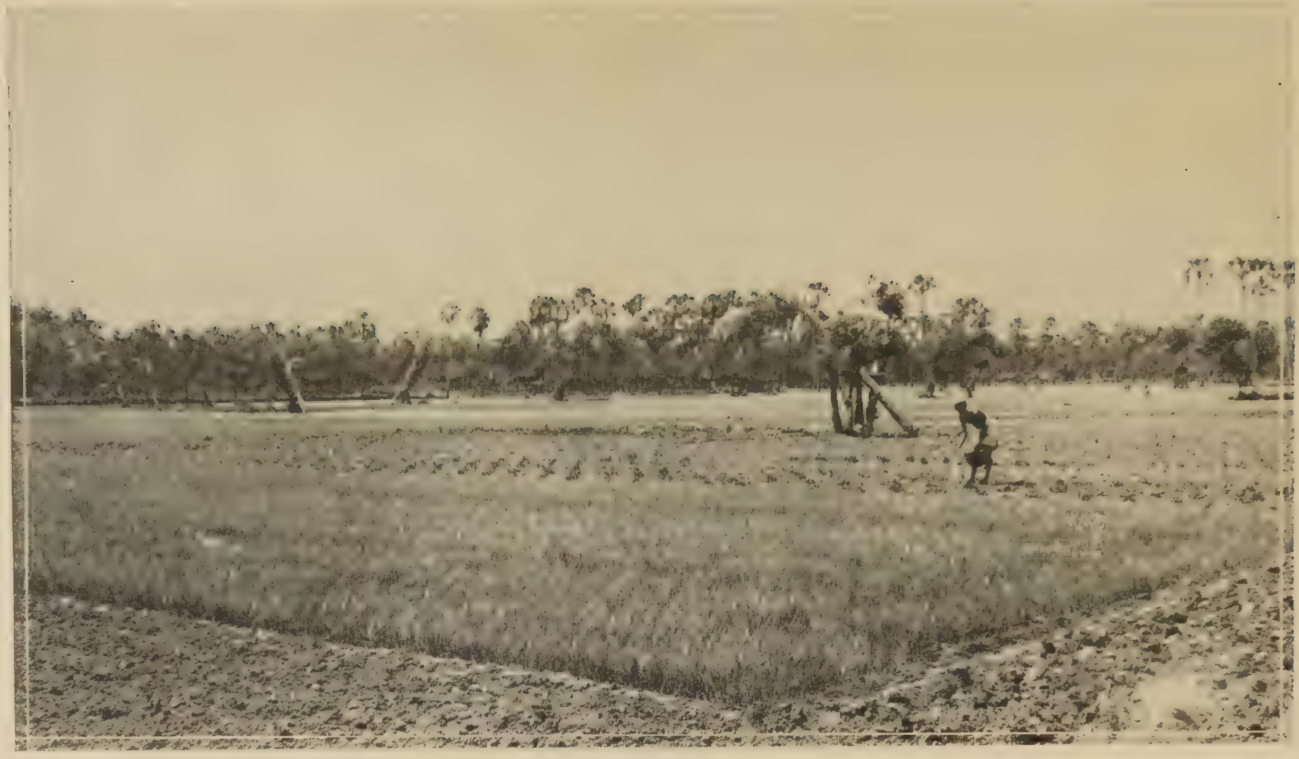


The "sinker" of the palmyra palm seed contains a young shoot which is highly esteemed by the Singhalese as a vegetable.

take its place there beside the coconut. Because of the depth to which the seedlings drive their sinkers, we had to have some very deep boxes made to germinate the seeds in, but this very characteristic is probably one of the factors that makes it successful in holding the sand dunes from drifting, as I understand it does.

Jaffna, like South Florida, has an abundance of fresh water underlying the coral rock on which her sandy land is laid. There were wells everywhere; I counted five in an area of not over two acres, and they were the most interesting wells I have seen anywhere in my travels. I watched the well gang operate one of them in the experiment station of Jaffna, where the cabbage plants in the selection experiment plots were being watered. The well sweep was made of a trimmed palm stem with crosspieces and was supported by living trees of *Thespesia populnea,* whose leafy branches shaded the men in loin cloths who climbed up and down on the sweep, forward to let the bucket descend into the well, backward, to bring it up. At the well curb a woman, who looked even more muscular than the men, poured the water from the palm-leaf bucket into a large jar which she then helped lift onto the shoulders of a third man, who in his turn carried the jar of water to the cabbage patch and delivered it to a woman who carefully poured its contents on a few cabbage plants. Think of two women and three men working all day long to water a cabbage patch, yet with wages at about twenty-five cents a day, costing the government less than a single man at home!

The intensity of the agricultural life here is remarkable. The roadway was filled with carts loaded down with leafy branches of trees that the farmers were going to bury in their fields to add humus to the soil. The same *Thespesia populnea* was extensively used for this purpose, as was also the Madre de Cacao (*Gliricidia maculata*) introduced by Mr. Drieberg from Nicaragua in 1895. I wished that some of my South Florida friends could see how much of this quickly rotting humus the Tamil farmers were using; it might stop them from burning up their



The clumsy sweeps of innumerable wells dot the farms of Jaffna's market gardeners.

palmetto trunks and encourage them to rot them down into humus instead, as my friend Edward Simmonds has for so long been urging them to do.

As I have said, there was an experiment station in Jaffna. We called on its Director, Mr. Cook, a very intelligent Eurasian who had extended his education by a visit to California, and who was well informed regarding the crops of Northern Ceylon and very courteous in his willingness to secure seeds of the palmyra palm and other plant material for us. In his well-run experimental farm I saw a remarkable collection of tropical yams and as some of the yams we introduced in the nineties are being cultivated in Florida, I was naturally keen to get the new kinds he had, especially one that Mr. Cook thought of excellent quality, the "Mothakavalli." It produces no tubers at all below ground

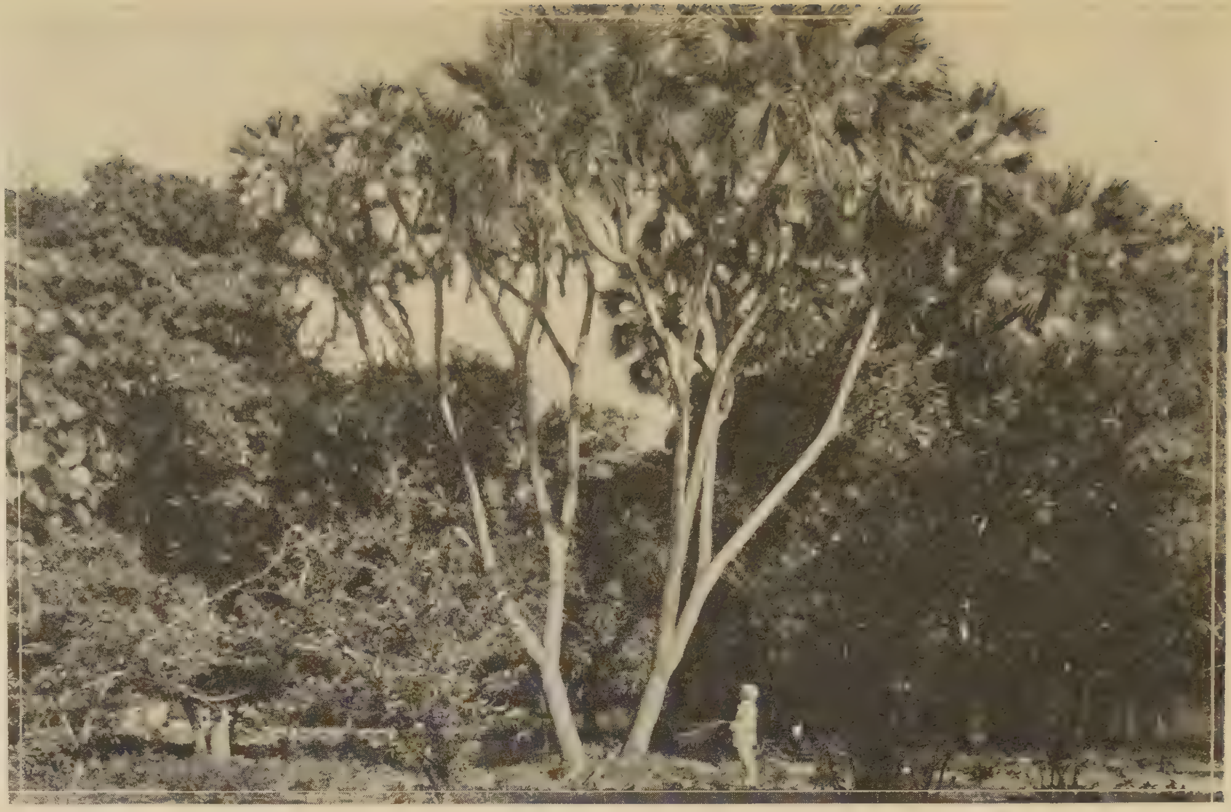
Watering cabbage plants in Ceylon is cheap because five men and women will work for what one person requires in America.

A cart load of branches of the quick-growing tree, *Thespesia populnea,* which will be buried in the ground to add humus to the soil in a market garden of Jaffna, Ceylon.

but bears large aerial tubers in the axils of the leaves. I have never been quite reconciled to the growing of my potatoes out of the ground on vines, though why one should always have to dig potatoes, instead of just picking them, is a question hard to answer. The yam is generally badly cooked in the tropics and inferior to the potato, but I learned once from an American woman in Brooksville, Florida, that if it is mashed on the stove, instead of after being taken off, the result is a soft, white, delicious dish, as delicate as mashed potato. Sliced and fried like potato chips, yams are also excellent. Robert A. Young, in his years of work in Florida with the tropical dioscoreas (quite distinct from the so-called "yams" of the South, which are true sweet potatoes) has developed new ways of cooking and serving these important vegetables.

We heard there were a number of rare plants in the park around the Resident's House in Jaffna, planted many years ago by a plant-loving Resident named Drake. We were repaid for going to see them, for there stands in the park the finest branching Hyphæne palm I ever saw, a stately thing with the aspect of a palm, but branching as a palm is not expected to do at all and does not do except in this one genus Hyphæne. From the wonderful way in which this specimen was growing in Jaffna I was encouraged to believe that the species would do well in Florida, so we gathered up all of the nuts we could find and sent them in. They are as large as your fist and have a sweet pulp, too dry to be really palatable, but enough like gingerbread to entitle the palm to carry the common name of Gingerbread or Doum Palm.

Near by, rather the handsomest tree in the park, was a fine example of the so-called Ceylon oak (*Schleichera trijuga*), a handsome evergreen shade tree loaded with small fruits that were slightly acid and quite edible. We gathered a basketful and sent them in and from them have come a number of small trees which are now growing in the similar soil and climate of South Florida.



A beautiful specimen of the gingerbread palm, *Hyphæne thebaica,* in the Resident's Park at Jaffna, Ceylon. This is one of the very few palms that branches. It is called the Doum Palm in Egypt.

But the most interesting tree of all was a relative of the orange, a splendid evergreen tree with spotless foliage (*Atalantia missionis*), the "Pamburu" of the Singhalese and the "Kuruntu" of the Tamils, a native tree of the drier parts of Ceylon. On the ground were numerous small seedlings but every fruit had vanished. I coveted that tree for the collection of my friends Swingle and Webber who have for years been testing every relative of the citrus tribe they can get. It was maddening to feel insecure as to getting it alive to Washington. The seedlings were too small to carry, there were no seeds, and the only alternative was to send bud sticks, with the knowledge that they would probably die en route, which they did. I also made arrangements to have the seed sent, but it is now three years and they have not arrived. Some day they will though, and it may prove a valuable stock for the citrus fruits of Florida.

During our drive about Jaffna we stopped in at the American Mission. Some of the boys showed us about, and incidentally pointed out a little garden more or less overgrown with weeds. It was the beginning of a school garden, I think, but when the Head of the Mission came up, I was disappointed to find he took little interest in it. I asked him what the boys were being taught and the answer was what might have been expected of any school teacher in America, with the same excuse, that the college requirements obliged him to teach things he thought of doubtful value. It was entirely a book education. I was reminded of an incident of the day previous when I was trying to get some one to help me dig up palmyra seeds. Among the little group of boys who gathered around us, I noticed one with a book under his arm who seemed to be the spokesman. I asked him if he would do it but he replied: "No, I am too busy, I am reading." "Oh!" said I, "and what are you studying?" "The science of fortune telling by means of palmistry, Sir," was the answer, and with that he showed me his dog-eared book. To teach them to read and write a foreign tongue, yet leave them ignorant about their own agriculture and the fascinating world of plants and insects around them, when a little knowledge would so greatly enrich their lives and help them to get through it with greater comfort, seems too bad.

I cannot leave Ceylon without saying a word about the flowering trees that constitute one of its attractions. Nearly everybody is told that the most beautiful of them all is Lady Amherst's beautiful tree (*Amherstia nobilis*), from whose slender branches flower clusters over two feet long hang like great crimson-pink orchids. I agree that no tree produces more spectacularly beautiful flower clusters, but when I think of the giant West African Flame of the Forest (*Spathodea campanulata*) which dot the hillsides with vivid masses of flame color, and the giant *Bombax malabaricum* (sometimes erroneously called Kapok), its stunning great scarlet flowers carried on gray leafless branches, I cannot agree with those who covet the Amherstia above every other flowering tree. Perhaps it is well I feel this way about it, for it is a very difficult tree to grow. Even in Ceylon it is reported not to thrive in the lowlands, and it seldom fruits, which is a great

The northernmost tip of Ceylon. This view lingers in my memory as a sad souvenir of Jim Dorsett, for in my last conversation with him, just a few hours before his death, he reminded me of this harbor scene at sunset.

pity, for more reasons than one. In the first place the long pods are a beautiful scarlet and in the second the tree would be easier to propagate. I tried in vain to get seeds, but there were none to be had. The plants struck from cuttings seem to be difficult to transport in wardian cases. Had the yacht with its equipment been available, Amherstias would have certainly constituted a part of its living cargo.

CHAPTER XXIV

ARRIVING IN SUMATRA

We had shipped off two hundred or so species of seeds and arranged for the sending of several wardian cases from Ceylon, and while we all felt we could spend our remaining days burrowing into the inexhaustible details of its tropical life, there were, after all, greater and more wonderful islands farther on. I knew this for I had been in Sumatra and Java, years before.

When I tried to find out from the tourist agencies in Colombo about the conditions of living in Sumatra, I could not discover that they knew anything whatever about the island. Furthermore they evidently did not care. They intimated that conditions of life in Sumatra were primitive; that the climate was much hotter than that of Ceylon, and that Mrs. Fairchild would be running a grave risk to go there. I appealed to our Consul, Mr. Turner, and he referred me to the agent of the Goodyear Tire Company, who with a wave of the hand remarked, "What stuff! My wife finds Medan more comfortable than Colombo and as for the hotels there, they are excellent."

The S.S. "Derfflinger" arrived just as we were ready to leave, so we boarded her for Sumatra. I could scarcely believe, as the breakwater of Colombo faded from my sight, that I was headed once more for the first tropical island I had ever visited, and that thirty years had passed since my visit there. Not only this, but to me Sumatra had remained, and still does remain, the most fascinating, the most mysterious, and the most interesting of them all. I tried to bring back the memories of those days. Part of them were spent with one of the great personalities of the Dutch East Indian Government, Dr. Melchoir Treub, the Director of the Botanic Gardens of Java, who had invited me to travel with him on his return from Holland to his post in Buitenzorg, and our first stop was at Padang Pandanjan on Sumatra's West Coast. The memory of that first tropical night on shore and of the noise of the myriads of insects and the smell of the vegetation and the sensation of being close to wild jungles and wild people sometimes comes back to me even though millions of later experiences have left their traces on my brain.

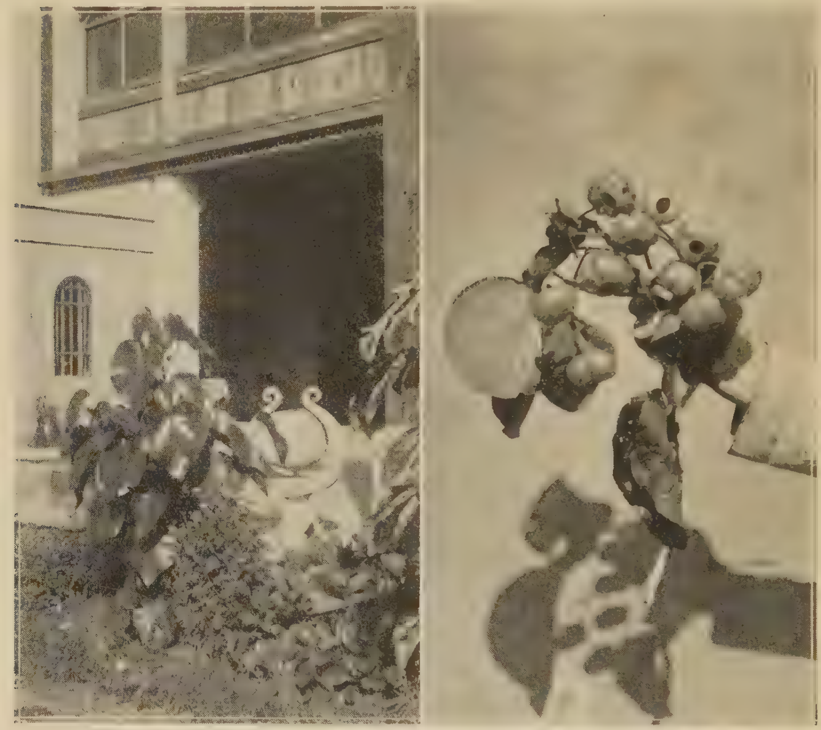
Another part of those days of long ago were spent with that incomparable world traveler, Barbour Lathrop. With him I sailed up the West Coast from Telok Betong to Kota Radja on a steamer of the Koninklijke Paketvarrt Maatschappij, when it was carrying soldiers to fight the Atchenese tribes of North Sumatra. We spent a Christmas at Kota Radja, visiting in an armored train the blockhouses surrounded by barbed wire entanglements the Dutch had erected to subdue the Atchenese. I can hear the commotion and see the scene in the saloon on the little steamer when two of the Malay stewards, one with a hatchet and the other with a dirk, clinched and fell into Mr. Lathrop's cabin, spattering his baggage with blood. While the other stewards screamed "Amuck, amuck," the Captain and Mr. Lathrop dragged the fighting boys out by their heels, and put them in irons. Fort de Kock, the Klof von Arau, Paja-Kombo and the Karabouwengat had been for all these years names of lovely places I had seen. It was at Fort de Kock for example, that I first had the experience of shaking a young giant bamboo shoot that grew by the roadside and having its great joints as large as pieces of two-by-fours, come tumbling down on my head.

So, as the steamer shortened the distance between Ceylon and the North Cape of Sumatra, all the memories of my Malayan days began to come back, even the language, which I used to speak, returned in a measure, and I was able to converse with some friendly Hollanders who knew the language and were keen to help me.

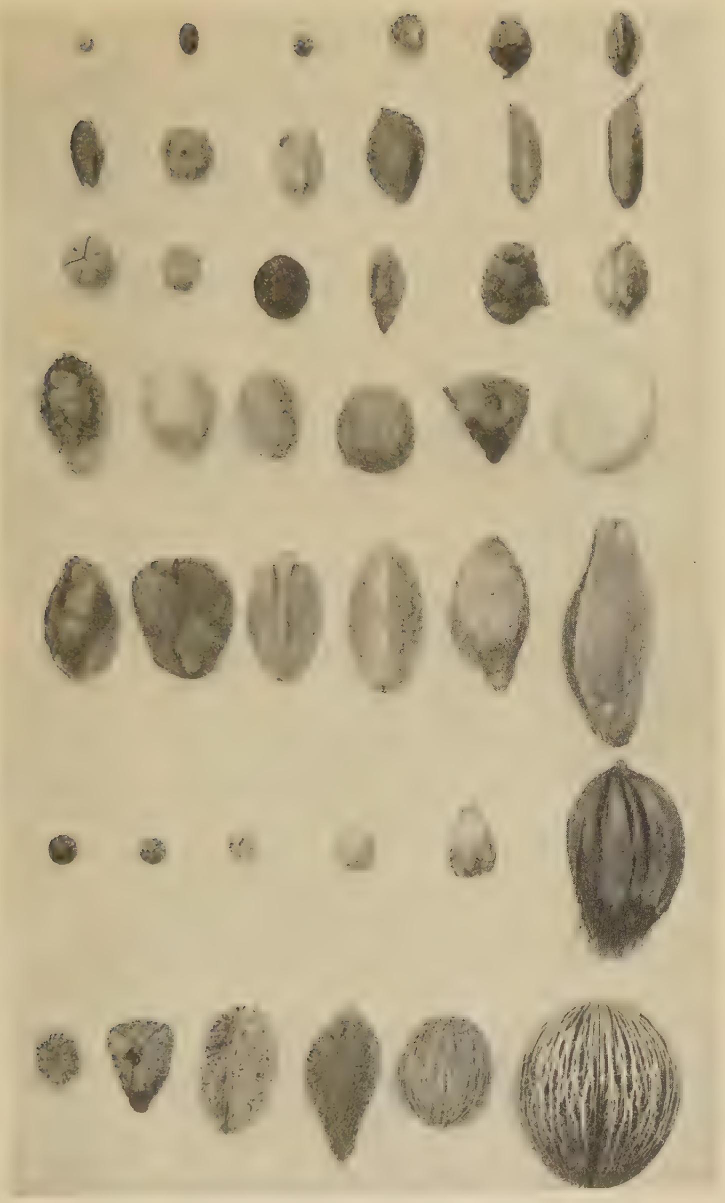
The sunsets brightened and the periods of calm increased and that strange laziness overtook us that comes on a boat in a tropical sea. I have experienced all kinds of lazy feelings, all kinds of day-dream sensations, but I declare that those on a boat in a tropical sea are the most curiously romantic. Many of the passengers on board would, I believe, have been perfectly willing that the boat should sail straight out into the sunset, leaving the watery sea for the sea of the sky with its cloud islands, and go on and on forever. When you experience this feeling, you are in the tropics, and, until you have had it, you cannot understand the tropics. Life there is always like Indian summer in its effects on the spirit, and there is a pleasure in laziness that I do not think there ever is in a cold bracing climate. Never to have seen anything but the temperate zone is to have lived on the fringe of the world. Between the Tropic of Capricorn and the Tropic of Cancer live the majority of all the plant species, the vast majority of the insects, most of the strange and dangerous and exciting quadrupeds, all of the great and most of the poisonous snakes and large lizards, most of the brilliantly colored sea fishes, and the strangest and most gorgeously plumaged of the birds. Not to struggle and economize and somehow see the tropics puts you, in my opinion, in the class with the boys who could never scrape together enough pennies to go to the circus. They never wanted to badly enough, that's all.

We touched for a day at Sabang, a tiny little island at the very northernmost point of Sumatra, and the coaling station for steamers to Singapore. There is a beautiful harbor, and were it not for the ugly coal sheds, Sabang would be an idyllic spot. We were the first people off the boat and had reached the little hill in the island before most of the others had landed. It was delightful. New forms of plants, a new island, a familiar but almost forgotten language, the Malay Archipelago once more! A stunning Erythrina tree was in bloom. There are few reds in nature more brilliantly luminescent than the red of the Erythrina. We began gathering the seeds and tore our hands to pieces on the spines. I expect to greet the trees from those seeds in Florida some day, for they grew.

As we started back down the hill I heard screams from people in a car preceding us, and a native by the roadside waved his hands at us and I caught the words "binatang, sakit." I could not make out what injurious beast he was warning us about, but the next moment we knew, for we ran into a swarm of wild bees of a very belligerent type and were busy fighting them. We fared rather better than some of the ship's company who were laid up for a week with their stings.



Right—The strange fruits of *Hernandia sonora,* a handsome tree from the Island of Sabang, north of Sumatra, have holes in them through which you can see their seeds. *Left*—A young tree of Hernandia in a door yard in Florida.

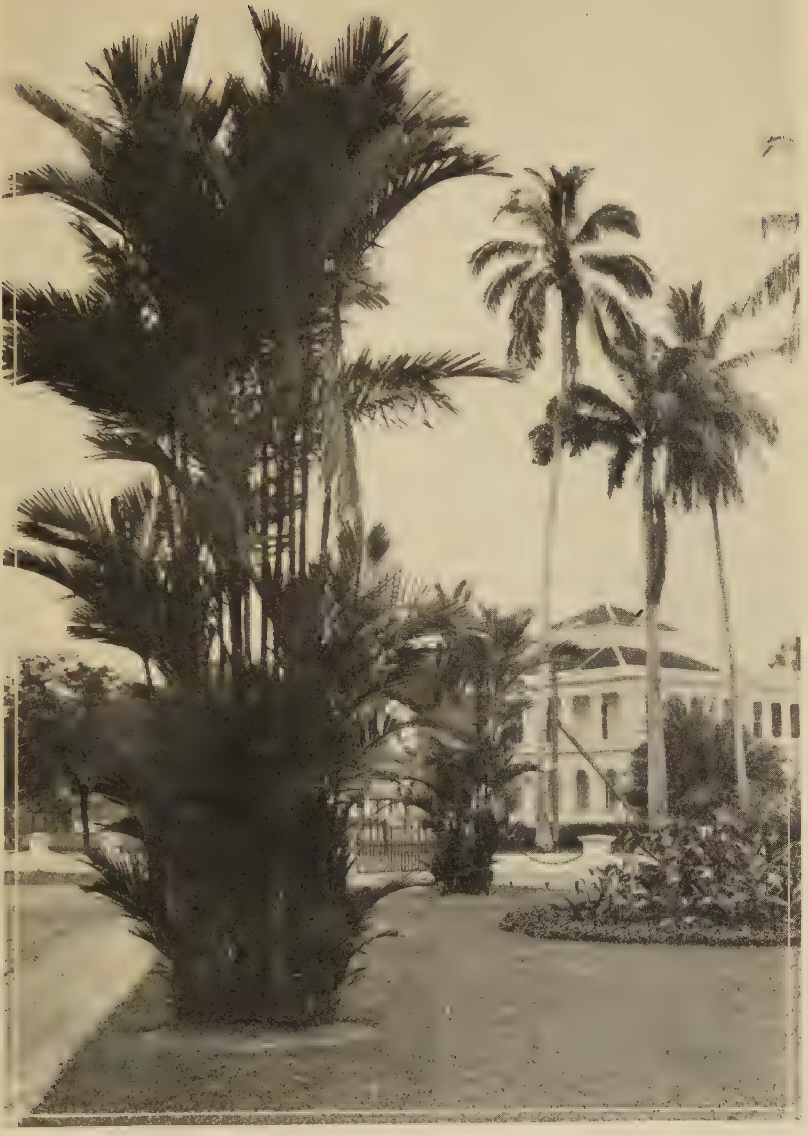


Some of the seeds that we picked up on the beach of the tiny island of Pulu We which lies at the northernmost tip of Sumatra. This beach is swept by ocean currents that come from the coast of India, Africa, Madagascar, the Seychelles, and the islands of the Java Sea.

There was a beach, and we found our way to it and got in our first botanizing and our first swim in the Malay Archipelago, and Graham caught his first butterflies. The weedy grasses and beach vegetation were not promising, but back of that we found ourselves among some handsome trees, evidently quite able to stand the salt breezes which sweep across this little island. As we looked up, Dorsett and I, to see if there were any seeds, we found that we were looking at some of the most curious fruits in the world. Imagine straw-colored, almost translucent pears hanging on long stems. Look at them from below, and you can see up inside them into a cavity in the very center of the fruit where hangs a shiny black seed the size of a marble. It belongs to a very small family of trees inhabiting the coasts of the tropics, but seems nowhere to be very abundant; *Hernandia sonora* is its name. Young trees from the seeds we collected are now growing in Florida. May they add a new tree to our beaches there.

I have wandered on many tropical shores, but nowhere have I seen such masses of drifted tropical seeds as on this beach at Pulu We. A look at any atlas will show the reader that this little island lies in a body of water whose currents, changing with the monsoons, may touch at some time or other the whole coast of the Indian Ocean, inclúding Madagascar, Zanzibar, and the Seychelles, and also those islands that border the Java sea.

Another day, and we were at last off the coast of Sumatra, the fourth largest island in the world, a tropical island as large as Great Britain and five times as large as Ceylon, populated by half a dozen tribes, some of whom were cannibals when I was last there. It has the distinction of having in its jungles the orang-outan ("Man of the Forest"), of being the home of the strangest flower in the world, the Rafflesia, single blooms of which measure three feet across! The island possesses a most wonderful tableland surrounded by active volcanoes "Het Bovenland,"—a plateau a million acres in extent with an inland sea hidden



The sealing wax palm (*Cyrtostachys lakka*), handsomest of all the cluster palms, because of its brilliant lacquer-red leaf sheaths, is common in the yards of Medan, Sumatra.

among its mountains, comparable to Lake Leman in size; and the Equator crosses it.

But what changes the years had made. Instead of a native kampong with a few tobacco-growers' houses about it, there is the modern, up-to-date town of Medan, with excellent shops and hotels, and back of it the largest plantations in the world of a Brazilian tree which in my day had scarcely been heard of by the Dutch, the Hevea rubber tree of the Amazon valley.

Belawan, the port of Medan, is not much of a harbor, and, as the Derfflinger was a through steamer, we were left to toss and pitch in a tender in the roadstead, with the low swampy coast presenting an unpromising welcome. Once in Medan the whole atmosphere changed. We had reached a Dutch tropical hotel where every room has a private verandah and fully equipped bathroom, the latter affording a luxury not equalled in Ceylon. It is true we had left the bathtub behind, but when one has lived months in the steaming tropics there is much to be said for the Dutch bathing arrangements. Instead of a tub or a shower there is a deep tiled basin or a square cement tank full of cool water, and a large dipper. Nothing is more gratifying than the shock of a good volume of water down the back, and as the floor is sloped and drained, one can splash all he wants to.

It was "Hari Besar" (big day), and from the rubber and coffee and tobacco plantations, cars were pouring in and the society of Medan was preparing for its bi-weekly pay-day dance for the planters and their families, who for two weeks, had been buried away from others of their own kind, far out on the plantations. Although one could see that the society was small, and more or less provincial, at any rate it gave a touch of gayety I had hardly expected, even though I had heard that Medan was in the center of the Deli tobacco-growing area of the island.

The Java Bank, the new Post Office, the attractive shops and the Governor General's residence, combined with the pretty residences, each with its lawn and ornamental palms, give a most attractive appearance. It may become one of the beautiful towns of the tropics; it certainly will if the residents continue to plant that stunning palm called the sealing wax palm (*Cyrtostachys lakka*). It is a small cluster palm, of ideal size for a private yard. Its long leaf sheaths, which, like a vase, seem to hold the spreading pinnate leaves, are sealing wax red, a red which harmonizes strikingly with the green of the leaves themselves. I had heard of the sealing wax palm even before I had ever seen the Orient, as it is often described in books of travel. There are single specimens in the Buitenzorg and Peradeniya and Singapore and Penang botanic gardens, but I had never seen it really in use as I saw it in Medan. There it has become a feature of the private gardens and a very attractive one. It is one of the very choicest of the palms. The first seeds which we collected in any quantity in Sumatra were the seeds of this exquisite little palm. Although our seeds failed to live I kept on writing at intervals for more, until I finally landed some alive. To my way of thinking, it is one of the palms which should be thoroughly distributed throughout all of those regions where it will grow, and until many hundreds of individuals are tested in many situations, nobody can predict where they will thrive.

CHAPTER XXV

THE MEDAN INSTITUTIONS

HERE we were, five of us, in Sumatra. The roads were good, and we wanted to get into the country. The only way to do so was to buy a car, so we picked up a second-hand Buick with the emblem of a crouching tiger on it, picturesque badge of the Deli Auto Club. It was our faithful companion until months later we sold it in East Java.

Our letters entitled us to call on His Excellency, the Governor of Sumatra, and our American Consul, Mr. Thiel, arranged the interview. His Excellency had known Dr. Treub, and of course knew the Minister of Colonies, my old acquaintance, Dr. Koningsberger. He spoke with pride of the new health resort at Brastagi he was building up and with a business-like despatch brought into our horizon the Chief Forester of the Island, Mr. Brandts Buys, with whom we were, as it turned out, to spend many interesting days in Atcheen, one of the lesser-known parts of this great island.

Mr. Brandts Buys was contemplating a visit to his forest stations north from Medan and urged us to accompany him. As we sat in his office discussing the possibilities, he reeled off a string of names. We would go to Tandjoengpoera, thence to Pangkalanbrandan, from there by Koelasimpang, Langsar, Lhoseumawe to Bireuen and from Bireuen up into the mountains to Takengon and Laoet Tawar. At Takengon we would leave the auto and trek on foot and pony back two hundred miles or so through Kota Dah, Pang Mop, Simpangtiga, Kota Kenjaran and Blang Kedjeren to Koetoe Tjane and round up in Kabandjahe.

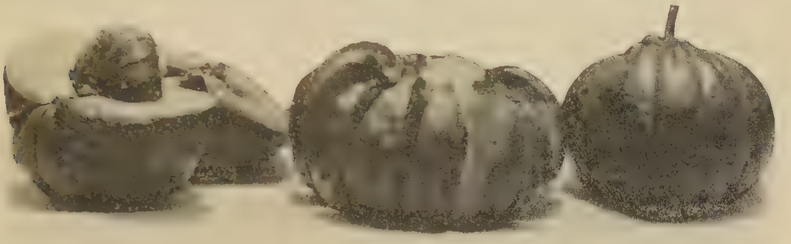
Mr. Brandts Buys spoke English, as all educated Hollanders do. I speak some Dutch and could help him out occasionally, but none of us talked Atchenese, and I shall never forget the bewildering sensation of that string of place names. It is curious now as I look back, how they have since become a part of our lives, for we made the trip with him, at least some of us did, and we have seeds growing in Florida and Honduras and Cuba and Panama, with many of these unpronounceable looking names attached to them. Every one of these, strange to say, is spelled phonetically and a Hollander has no doubt in the world as to how to pronounce them. They are not like Newara Eliya, in Ceylon, which is pronounced in English as though it were spelled Nuralia.

A pile of mangosteens in the market of Medan, where they are more plentiful than oranges.

In the interim before we started up the coast we had time to visit the Proef Station or Experiment Station of the great "A.V.R.O.S." (Algemeene Vereeniging Rubberplanters Ost Sumatra). This general Association of Rubber Planters on Sumatra's East Coast is one of the greatest companies now operating anywhere in the tropics. As we drove in the direction of the Station we passed a beautiful white stucco building in the suburbs of Medan. It was as attractive as an art museum, but as we were looking for an experiment station, we passed it and drove on, only to be turned around and sent back to it by the next man we asked directions from. When we entered the spacious hall and visited the beautifully equipped, spick-and-span laboratories, Dorsett and I looked at each other and wondered. We had seen beautiful experiment stations before, but one such as this had not even entered our imaginations. And here it was, on the very edge, so to speak, of the tropical jungles of an island about which it was difficult to learn anything in Ceylon, and in the suburbs of a town which thirty years ago was only a native kampong. It was a palace of research maintained by a great commercial company that was developing the resources of Sumatra. As we were shown the courtesies of the laboratories and met the young research men who were working on every sort of question connected with the rubber and other plants in which the A.V.R.O.S. is interested, I could not help rejoicing to see the evolution of the new and modern method for man's control of the vast resources of the tropics.

For countless generations those humans born within the borders of the tropics have been trying to cope with the jungle, and so far as one can judge, with mighty little success. Their houses, their tools, their sanitation and their intellectual lives have remained very close to savagery. The jungle has been so near to overwhelming them all the time; its weeds, its reptiles, its insects, its fungi which attack their cultivated plants, and its diseases which attack and kill or disable them, have all combined with a climate that stimulates indolence to hold tropical men back. White men by the hundreds of thousands have ventured singly into its shades, have cleared patches of land and planted their crops, only to leave their bones somewhere in the jungle. One could almost paraphrase Byron's saying "Man's control stops with the shore" and apply it to the jungle rather than to the sea. Man has now organized in great groups, in industrial armies as it were, and to-day is conquering the jungle so fast that those of us who love its mysteries and its wild life tremble lest these armies destroy it completely. This Proef Station with its bacteriologists and chemists and entomologists, represents part of the great fighting machine with which this industrial army is combating its tropical enemies.

There is another point of view also from which such gigantic associations of capital as that represented by the A.V.R.O.S. is interesting. Among the growing army of scientific discoverers throughout the industrial, chemical and medical world an individual may arise at any time with a new idea, which, like the idea of Goodyear, may make necessary to the civilization of the great temperate regions some as yet unsuspected resource of the jungle, some tree perhaps, known now only in the dry tomes of a systematic flora. The A.V.R.O.S. forms the link between the new discovery and the plantations of raw material required to put it into action.



One of the most interesting relatives of the mangosteen, the Assam Gloegoer (*Garcinia atroviridis*), with a rind that is half an inch thick and which splits naturally into segments. These turn inky black on drying and are as sour as hydrochloric acid. They are much used for flavoring curries.

There is something quite American, I find, about the Hollander as you meet him in his colonies. He is casual, sincere, and hospitable. Dr. de Jong and his assistants were amused, I presume, by my quest for the relatives of the mangosteen but they showed me all they had, and there for the first time I saw the "Assam Geloegoer" (*Garcinia atroviridis*), used, like the "Goraka" of Ceylon (*Garcinia cambogia*) in curries. Its rind splits naturally into segments on ripening, and these, when dried in the sun, turn black and keep for weeks, retaining their incredible sourness to the end.

I had not come to Sumatra to study the rubber situation. If I had been going to study it I should have done so when I first visited Singapore in 1896, at which time Dr. Ridley showed me the trees on which he was working out the modern method of tapping. But who could have guessed then that America would ever have any tropical territory or that she would develop a sense of the importance of the tropics. Our manufacturers were getting the little rubber they needed from up the Amazon and there was not a single American who would have listened five minutes to any talk I might have given him about plantation rubber in the Orient.

Mr. V. Van Helten, who is believed to be the first to bud the Brazilian rubber tree, is here shown standing beside the tree he budded, in Buitenzorg, Java. The budding was made in September, 1917, and plantations of grafted trees now cover hundreds of acres in the Orient.

However, when the director, Dr. Heusser, showed me some of his grafted or budded rubber trees and told me that as much as fifty grams of rubber had been taken from a budded tree only seven years old, whereas the average of the seedling trees in the plantations was only seven grams, I could understand what a chance there may be in the substitution of budded trees for seedlings. Later on, near Langsar, I saw one of the more progressive estates, and was shown a small commercial planting of budded trees. While every experience of the orchardist would seem to point to the advantage of growing trees budded with wood from record latex bearers rather than the hit-or-miss seedlings of unknown ancestry, there appear to be a good many points still to settle before extensive plantations of budded rubber trees become a factor in the rubber situation. That the industry is pointed in this direction seems certain.[1]

Sumatra seems to be the rubber growers' paradise. I judge this from the comparisons which one of the progressive planters drew between the labor conditions there, and those in Java and the Malay States. The Sumatra planter contracts with the Government for his labor, guaranteeing certain comforts. In return he is insured against certain defections on the part of the laborers, most of whom he brings from Java. He does not have to deal with any labor organization or with any native chief in the employment or dismissal of his laborers, as the planters in Java and the Malay Peninsula must do. The supply of Javanese labor is the greatest factor in the rubber situation in the Orient, it would seem. When one compares the systematic agricultural habits and the teachability of the Javanese, with the characteristics of almost any other race which to-day is tapping rubber, I do not see how one can fail to appreciate the advantage they bring. The tapping of rubber is almost a carpenter's job. It requires a steady, trained hand to push the flat gouge along the upper edge of the thick bark and pare off a thin shaving from it without either cutting into the tender growing layer of cells, or cambium, or leaving some of the bark by cutting too far from it. To do one or the other brings burylls or knots that interfere with the tapping years later. In Sumatra there is a system of penalties and bonuses depending upon the amount or lack of these injuries, and an inspector checks up the work of the tappers and keeps a record of each one's work.

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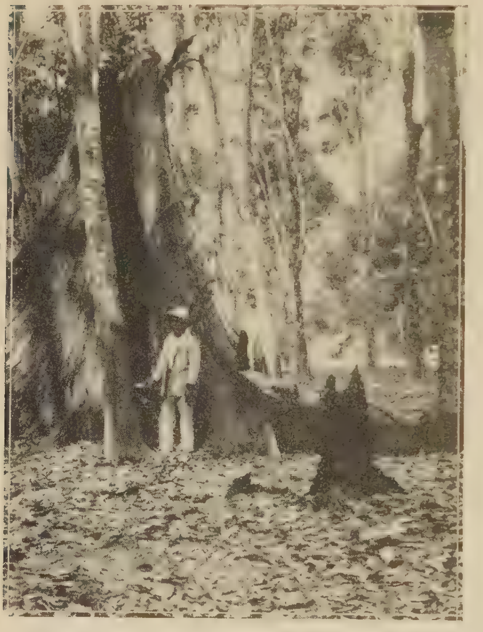
[1] I learned more about the budded rubber later from Dr. Cramer in Buitenzorg, to whom is accorded the honor of first budding rubber trees on any considerable scale. The 3rd of March, 1916, marks the first consideration of its possibilities by Dr. Cramer and M. G. F. Boddle. In Sept., 1917, Mr. V. Van Helten put in the first bud, and the first plantation was made in February, 1918, at Tjikeumeh, Java, and there are now several thousand acres of budded rubber trees on trial.

The plantation I visited had 2400 acres, and was operated by nine Europeans who managed the machinery and the 800 Javanese tappers and collectors, many of them women. The highest pay of the tappers amounts to about $7.00 a month, without food supply, and a good tapper will tap 400 trees a day and do it in four hours of continuous work.



So quick has been the transformation that the old stumps of a previous jungle still remain in the new plantations of Brazilian rubber trees in Sumatra.

I shall not forget the sensations this trip through the large plantation near Langsar gave me. Man had, in my lifetime, substituted a forest from the Amazon for a primeval Sumatran forest, and had done it so hurriedly that there, among the straight rows of large Brazilian rubber trees the giant blackened stumps of the original Sumatra trees were still standing. I was reminded of an evening in my own home in Washington, when Dr. Huber of Para told me of his trip for the Brazilian government, to see what plantation rubber in the Orient was likely to do to the Brazil rubber industry. "Brazil can never compete with the Orient, we haven't the labor," was the way he put it.

There is another Experiment Station in Medan, that of the Tobacco Planters of Deli. I wanted particularly to see this, for it was the first of the private experiment stations that Dr. Treub had just succeeded in getting started in 1896 when I landed with him in Java. It was his newest toy then, and Breda de Hann was its first director. I could not but recollect those early discussions around the dinner table in Java as Dr. Palm, the present director, told me of the widespread distribution of mosaic diseases in the tropics, diseases, the very existence of which was not suspected in those days. As an indication of the change that has come since the nineties, it is interesting to know that over a million dollars a year is spent by the private tropical plant experiment stations in the Dutch East Indies.

CHAPTER XXVI

IN THE ATCHENESE HIGHLANDS

At last our camp equipment was ready for the trip with Mr. Brandts Buys, and the cars were loaded with bed rolls in oilcloth covers, and tin cans full of clothing and supplies of all sorts. Tins full of alcohol, tins full of photographic films, tins full of food, everything in tins to protect them from the tropical downpours. To dry plants between sheets of paper is an easy matter in dry regions. Maire in Morocco, for example, used newspapers, and every night used to strew his half-dried specimens all around his bedroom and the next morning gather them together again into his wire press. Such a method, however, does not work in the dripping rain forests of Sumatra where all day long the relative humidity stands around 90% and in the morning may be as high as 99%. The speed with which a plant molds there is amazing. To prevent this the newest technique is to lay the specimens between the driers, and when a large package has been made slip it into a tin case, pour some alcohol into the case and seal it up. A pint of alcohol in a five-gallon can will keep the plants from decay for a very long time. The drying process can later be completed by artificial means.

There were so many tin cans (altogether too many, Dorsett maintained, and I believe he was right) that Graham and Dorsett had to travel part way by train. I wanted to see the vegetation fringing the coast of Sumatra and compare it with that of South Florida. I have always wondered if certain Asiatic species composing the coastal swamp vegetation of Asia might not be introduced into the American mangrove swamps that have come to play such a part in the beauties of southern Florida.

The day was hot, but the roads were good and soon we were traveling north through the low country near the coast, bound for Takengon. If one does not mind the heat, the low country is by far the most interesting botanically, for there is where the strange palms, lianas, and dank tropical jungles are at their best. We passed through native pepper plantations, and, as I waded through the long grass to refresh my memory of this strange evergreen vine, hanging in tresses from the shade trees on which it is trained, I could not help thinking how strange it is that the tiny black fruits produced by this relatively uncommon vine should have found their way onto the tables of civilized man throughout the world, becoming the universal companion of salt, that essential mineral of our foods. Its appearance on man's table dates back far beyond Roman times and it is recorded that Attila the Hun demanded as part of the tributes in the sacking of Rome, 3000 pounds of black pepper.

Leaving the road we went by motorboat out into Aroe Bay where the mangrove vegetation with its long hanging fruits, ready to drop and float in the water, reminded us all of the coastal mangroves of Florida. Even the stories of crocodiles were not wanting. In the swift currents of the bay many fatalities have occurred that were to the advantage of these water demons. Sixteen natives were eaten by these brutes in a single eddy.

I was interested in the "Niri Boenga" (*Xylocarpus granatum*), claimed to be the best of the tidal swamp tanbark trees, but I cannot see any early chance of its being utilized. In order to add its interesting form to our own mangrove swamps I accepted Mr. Brandts Buys offer of seeds for America. The two Asiatic Rhizophoras (*R. conjugata* and *R. mucronata*) were here mingled, neither species however, producing trees so stately as our own mangrove (*Rhizophora mangle*), and although their aerial roots are as remarkable, I am inclined to believe that so far as bizarre and fascinating forms are concerned, Florida can be proud of having some of the finest mangrove swamps in the world. May she long be able to keep them. They are making land for future realtors to sell, perhaps, but they furnish to-day one of the most unique plant sights in the world.

I have long hoped to see the Nipa palm (*Nipa fruticans*) growing on the shores of Biscayne Bay. It inhabits the low salt marshes of the Oriental tropics, where its masses of great erect leaves rising from the ground add much beauty to the coasts of this whole region. I once succeeded in getting some seeds of this palm started and Prof. Chas. T. Simpson of Little River, Florida, even got one of them to grow in his hammock, but do what he could, he was not able to protect it from the crabs. It was exciting to see the nipa again and to arrange for another shipment of the heavy fruits, though a year later the failure of the shipment was announced.

Passing through a little village we all scented a delightful fragrance and found it came from the avenue trees lining the highway. They were covered with yellow blooms and the whole make-up of the tree seemed to fit it in a peculiar way for the making of a tropical avenue. It was *Pterocarpus indicus*, a leguminous species that deserves to be thoroughly tried out in South Florida as a shade and avenue tree. More seeds must be secured, however, as those we sent in failed to grow.

As we passed through a native market by the roadside and I got out to look at a strange fruit, which to this day I have not been able to identify, Mr. Brandts Buys whispered to me that this was one of the places where they had had trouble with the natives, and a little further along the road where we stopped to change a tire, I noticed that he kept a sharp eye on some surly-looking fellows in a hut near by and he told me that he did not like their looks. Aside from these incidents the whole trip was through a seemingly friendly country.

The hotel at Langsar had been kept for many years by a man who took an interest in insects, and when he heard that Graham was collecting them he told us that near the oil field of Darat, where one of the wells burned night and day he had seen the great Atlas moths so abundant that they formed great windrows on the ground under the lights, and that he had seen tigers from the forest feeding on them. We noted this locality on our map as one to visit, but were never able to do so.

I think the drive from Langsar to Lake Tawar deserves to rank as one of the great drives of the world. It skirts the lowlands for about one hundred miles and then climbs between mountains almost ten thousand feet high to the enchanting mountain lake, or "laoet," Tawar.

The water buffalo does not work in the heat of the day, but takes a bath if it can find a mud hole to wallow in.

The lowlands were hot and it was afternoon before we reached Bireuen and began to climb. Roads in a tropical mountain region where hand labor is cheap and bridging material expensive are about the crookedest things in the world. They follow in and out every ravine or gully on the hillside. One's steering wheel is constantly turning, and turns too sharp to make without backing are frequent. The sun set and a brief twilight ensued, followed by a rising moon, as we climbed up onto the ridge, with tropical jungles stretching away on either side. As we dipped down into the deep shadows cast by the mountain, we heard a distinct roar from the forest. Brandt Buys whispered to me, as though he thought the cry might alarm Mrs. Fairchild, "It's a tiger." We were delighted and listened for the next scream. It was thrilling to be traveling by moonlight through a jungle infested with man-eating tigers. Two men and four bullocks had been dragged off this same road by a man-eating tiger the month before as they were driving bullock carts to Bireuen.

A quiet bay on Lake Tawar, in the jungles of North Sumatra, with terraced paddy fields in the valley and pine-clad hills in the distance.

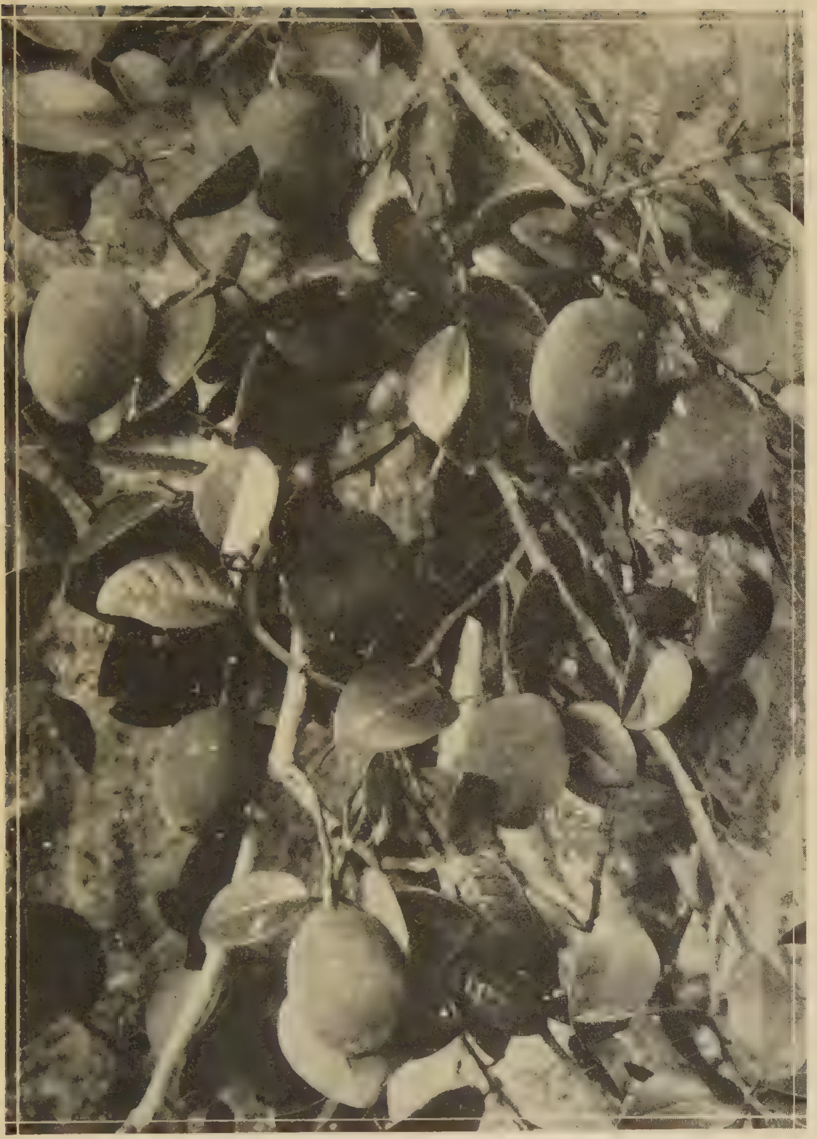
On a sharp high turn we stopped and got out. Going up into the forest a hundred yards to a little lookout, we saw before us Lake Tawar, shimmering in the moonlight below. Dark mysterious mountains surrounded this little lake in the jungle, a few white houses on its shore marked the village of Takengon. It was an enchanting tropical scene.

In a few minutes we pulled up before the passangrahan or Government owned resthouse at Takengon. Dorsett and Graham were waiting for us at the door and the rijstaafel was ready in the kitchen. The rijstaafel of Takengon, this tiny speck of a place in Atcheen seemed better, with more strange things in it, than had the finest Ceylon curry we had eaten in Kandy, but then the temperature had something to do with it, for the thermometer stood at 54° F., and we rubbed our hands to warm them.

A Gayo of the Atchenese Highlands on the shore of Lake Tawar. The Gayoes are an agricultural race.

Those mornings in Takengon; how shall I describe them? They held the quality of spring. The clear cool air and brilliant sunshine made one think of northern latitudes. The courtesy of a launch ride on Lake Tawar was extended to us and as the sun broke through the clouds in great streams of light we explored its shores. The lowlands were filled with paddy fields, the ravines were masses of tangled lianas, here and there gigantic clumps of bamboos waved their stems in the air and at one point a perfectly enormous mango tree stood all by itself in the landscape. The mountain slopes themselves were covered with pines, solid stands of the Merkus pine (*Pinus merkusii*) which Mr. Brandts Buys wanted us to see. On one side of the lake we passed the cunningest doll-house-like little dwellings on piles, seventy-five of them, summer "cottages" of the Gayo people where whole families come to spend a month and fish. At the season when the "Tepik" wind blows in August, shoals of small so-called Tepik fish frequent this shore and the people catch them by the millions from these houses on the water and dry them there to eat with their rice. One gets the impression that the Gayoes lead a pastoral and peaceful family life on the shores of this mountain lake.

There was a road halfway round the lake and we started out along it one afternoon, botanizing up into the pines, where Dorsett discovered a remarkable tropical raspberry with light red fruits and leaves that were golden brown beneath (*Rubus chrysophyllus*, Reimer). This was a new collecting field and we were keyed up; we did not have any idea of what might be ahead of us. I happened to be alone for a moment on the trail when, looking up, I saw before me a gray cliff over which was festooned the loveliest evergreen climbing fig imaginable, with a hundred or more brilliant scarlet fruits set off by the glossy green of the foliage. The habit of the plant reminded me of the common *Ficus repens*, but the leaves were coarser and the fruits several times as large and the most striking scarlet color I have ever seen in any fruit. As I stood looking at it and wondering if the fruits were good to eat, and how we could get some of them, and how lovely a plant of it would be on the wall of a house in South Florida, I was conscious of experiencing in a measure the delights of those early explorers who first set eyes on the Victoria regia or the rafflesia or the jacaranda, let us say. The party came up and it was with some difficulty that Jim and Graham scaled the cliff and brought down the fruits. They were as harsh and rough to the touch as a piece of sandpaper, and the foliage was harsh too. The superb-looking fruits were not good to eat. Alas, though we packed the ripest seeds we could get, in every way known to us, and posted them, as well as some cuttings, from Takengon by letter post, none of them reached America alive. So far as I know, it has not yet received its baptismal scientific



A scarlet fruited climbing ficus which covered a limestone cliff on the shore of Lake Tawar, Sumatra; one of the things I should like to go back to get.

name; the photograph published here constitutes its first appearance in public. Some one must return to Lake Tawar and get it so that it can be brought into cultivation. If the yahct had only been at hand this fig would now be growing in Florida.

Mr. Brandts Buys wanted us particularly to see the stands of merkus pine, as he was working on the theory that vast forests of it could be developed in these Sumatra highlands, and since it is an excellent turpentine-producing species this would add great wealth to certain mountain regions of the Dutch East Indies where little that is of value is now grown. His first problem was to check the fires and stop the encroaching tall grasses which are the destroyers of the pine forests. These two agencies work together in an association more perfect than many of the "symbioses" of field botanists. Grasses alone cannot destroy the forest, but combined with fire they are destroying it everywhere. Let grasses start at the edge of the forest where they get enough sunlight, then if they catch fire in the dry season the trees on the edge of the forest will be burned, and into this fringe of dead leafless trees the grass spreads with the next wet season. Repeat this process for centuries and the lands capable of supporting the trees will become grasslands. Nowhere have I seen more striking demonstrations of this phenomenon than here in the jungles of Atcheen. By grasses I do not mean the blue grass which the colored man cuts from your lawn every month. I mean grasses as high as your head, grasses that make so thick a carpet on the ground that seeds dropped from the trees cannot get through, grasses that you could grub out every week from the ground and that would grow again where you had thrown them to die. Grass is the curse of the tropics, as every planter will tell you. Shading it out with other plants seems to be the only method of combating it.

So we drove down the highway to Lampahan and struck through into the dense forest. The road became a mere trail, the vege-

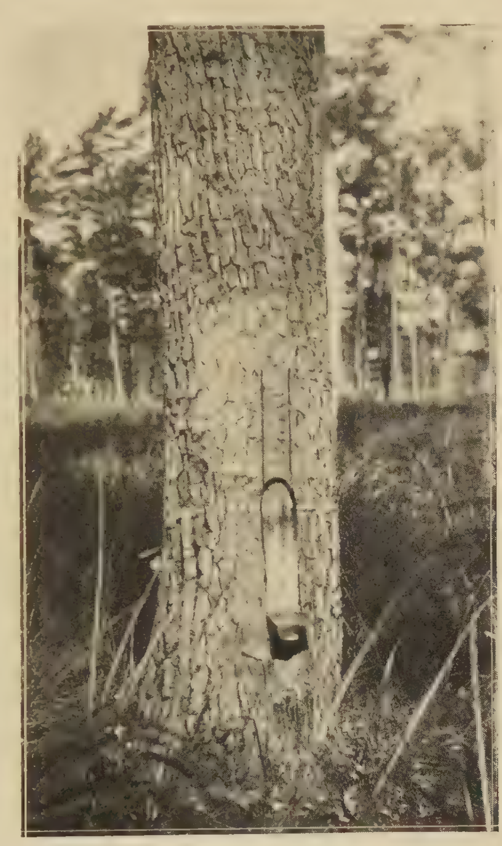
A good stand of the merkus pine (*Pinus Merkusii*) which Mr. Brandts Buys thinks may become a producer of plantation turpentine in Sumatra.

tation became more dense on either side and the tree buttresses became larger. There are no giant trees such as the California sequoias and redwoods or the Australian eucalyptus to be found anywhere in the tropics; they do not exist there, but why this is so is one of the botanical puzzles. What seems to me the most striking difference between the tropical jungle and such a forest as the redwoods, for example, is the tangled character of the one and the simple open character of the other. In the redwood forests, as far as you can see, the trees are redwoods; the same type of tree meets your eye wherever you look. In a tropical forest you may have two hundred species of trees in a single acre, a bewildering arboretum if you please, with nothing labeled, and with the flowers a hundred feet above your head where the monkeys are playing.

We stopped under a strangler fig, which would serve as a landmark, and with our long knives in our hands scattered through the forest to do a little collecting. The undergrowth was dense, there were numberless climbers with recurved spines; every step of the way had to be hacked, and it was surprising how quickly one got lost and how far away and faint the calls of the others became. Go into a corn field and notice how quickly you get into a silent world, and how soon you feel yourself alone. A strange distant sound like the bark of a dog, and yet different, reminded me that the native forester had reported meeting a tiger on the trail the day before.

Ahead of me stood a smallish tree with branches low enough to the ground so that I thought I could get specimens of its foliage and flowers if it were in bloom. To my surprise it was unmistakably a citrus tree, but since there were no flowers or fruit the question of what species it was has remained in doubt. I am inclined to think it is a wild form which Dorsett later found in fruit.

As I hacked my way through the dense tangle of climbing ferns and grasses I happened to look down, and pushing the tangle aside with my long knife I found I was on the very brink of a deep gulley and that the enormous green leaves below me were the tops of tall tree ferns growing up from its bottom. One winces a bit at such discoveries and can hardly help wondering how it would ever be possible for one's friends to find one should one fall into such a gulley in a jungle which it takes days to cut through in a single straight line.



The Brandts Buys' method of tapping the merkus pine of North Sumatra. It seems a more refined method than the one used in America and one less injurious to the trees.

The turpentine still stood in a magnificent stand of the merkus pine some miles further on. It was a clearing in the forest like many I had been familiar with from childhood, for in place of the myriad species of trees we had been seeing in the jungle, here we were surrounded by the trees of only one. The turpentine tappers were at work. Mr. Brandt Buys had designed their special tool and prescribed the method, which is the most refined of any turpentine tapping I ever saw. It stood out in strong contrast with the crude, inhumane methods of our own southern states, where a tool of the most primitive make is used, and where little attention is paid to the life of the trees. It suggested the rubber tapping technique, which has been the secret of the success of plantation rubber in Sumatra. Only a small thin chip is taken from the wound each day, and while I shall not go into a discussion of its superiority over the French or American methods, I cannot help reminding those who may be inclined to be skeptical, that the Dutch have made great successes of plantation chincona, of plantation tobacco, and of plantation rubber, and are making great progress with their plantations of West African oil palm, manila hemp and gutta percha. Plantation turpentine may yet come on the market.

We botanized another day, the whole party of us, from the highway, using the automobile as a base and spotting fruits and flowers in the forest near by. If anybody imagines this has any resemblance to botanizing from an automobile on the Great Plains, he must revise his notions, for the flowers on a level with our eyes were in tall trees that rose from the steep mountain side far below the highway. To hack one's way down to them took much time, great physical exertion and some risk; then, in order to clear the trunk of the tree so that it could be climbed, all kinds of spiny lianas, incomparably worse than any green briar or saw briar which grows among the sassafras trees of Maryland, had to be laboriously gotten out of the way.

Festooned from many of these forest trees hung climbing species of ficus with extremely decorative fruits, not so beautiful as the ones we had found on Lake Tawar, but still very attractive and certainly desiderata for South Florida. One of the most attractive of these Jim Dorsett had a hard climb to get. Anyone less determined and less agile would have given it up, so we photographed him holding it as he stood panting from his exertions in the sunlight. The fruits were not ripe, but we wrapped some cuttings with the greatest care and posted them, letter post from Takengon to Washington. They were propagated as F. P. I. 67559, *Ficus callicarpa,* in the tropical gardens of the late Dr. H. Nehrling at Naples, Florida. Some day it will add its beauty to the tropical vegetation of that new commonwealth.

One morning while the others were busy with their preparations for the trek through the jungle, Mrs. Fairchild and I motored with Mr. Brandts Buys to a point on the trail where I had seen a relative of the chestnut, a *Castinopsis,* the seeds of which I thought I could easily get. With our klawongs we scrambled up the steep slippery slope into the jungle, and the undergrowth closed in around us. It was stiff hacking and going. Suddenly not a quarter of a mile away we heard the unmistakable snarl of a tiger. When that snarl breaks the uncanny stillness of the forest it startles anyone! It was pretty near, but not so near as we were to the road, so we kept on. Another snarl still nearer: evidently the beast was coming our way. Another and another, each louder than the last, and finally Brandts Buys said that while ordinarily tigers stalk their prey stealthily and at night, a hungry man-eater will roar around and even attack in daylight,

Graham Fairchild examining Jim Dorsett's climbing ficus (*Ficus callocarpa*) as it first appeared in an American nursery. Mr. Charles Codwise (left) who cared for and propagated cuttings from it after Dr. Nehrling's death.

and as this one was so evidently coming our way he thought we had better get out of the jungle. Mrs. Fairchild most heartily agreed with him, so we withdrew, though not before I had satisfied myself that there were no ripe seeds on the tree. A few days later, Mrs. Fairchild and I, thinking that our nerves had been in no way affected by this experience, which we had both keenly enjoyed, returned to this same highway about dusk and made our way across an open field up to the edge of the jungle. I started collecting while Mrs. Fairchild got out her little alcohol lamp and started to brew a pot of tea. Suddenly there was a crash right behind us. I think both our hearts were in our mouths. A great branch, loosened by some storm, had fallen, although there was not a breath of air moving, but the idea of camping out alone in the forest as we had often done elsewhere, lost its attractions.

CHAPTER XXVII

TAKENGON AND HET BOVENLAND

We spent nearly a week in Takengon, all of us together, before things were in readiness for the more strenuous part of the trip, the two-hundred-and-fifty-mile trek through the forest, but at last the coolies had all been engaged, the live chickens bought, the apportionment of the loads for each had been made and everything was in readiness. Who was to go? Mrs. Fairchild was only a few weeks out of the hospital and could not go, and I had been having a good deal of trouble with my feet, an old case of flatfoot. Some one familiar with the material we had already collected had to remain to attend to it or it would be lost. I was not willing that one of the next generation should be deprived of the experience and Dorsett did not drive the car, so it fell to my lot, so to speak, to be left behind. It was rather a bitter thing, but then the whole region was so full of interest that I soon forgot it.

We had not imagined that taking leave of the boys, where the road ended and the trail into the jungle began, would be any more exciting than watching a group of friends disappear on the rear of a Pullman train, but it was. The trek was about as far as from Washington to New York. It was to take ten days or two weeks and there was no way of getting word to them during this time. We were to motor back to Medan, get up again on the high tableland from there, and meet them at the other end of the trail. Just at the last minute, as if to add spice to the excitement, Brandts Buys came to me with the news that not fifty miles from where the trail passed, some Atchenese had, a day or two before, ambushed a small guard of Dutch and Amboinese soldiers, massacring most of them, and as there were to be foreigners in the party the Governor had thought it wiser to send a guard of soldiers with the expedition.

It was quite a sight to see them start. Beside the chief forester there had been added to the expedition Mr. Fernandes, the local forester, so that the party consisted of five white men, with three ponies for those who got tired of walking, and an imposing number of coolies and soldiers.

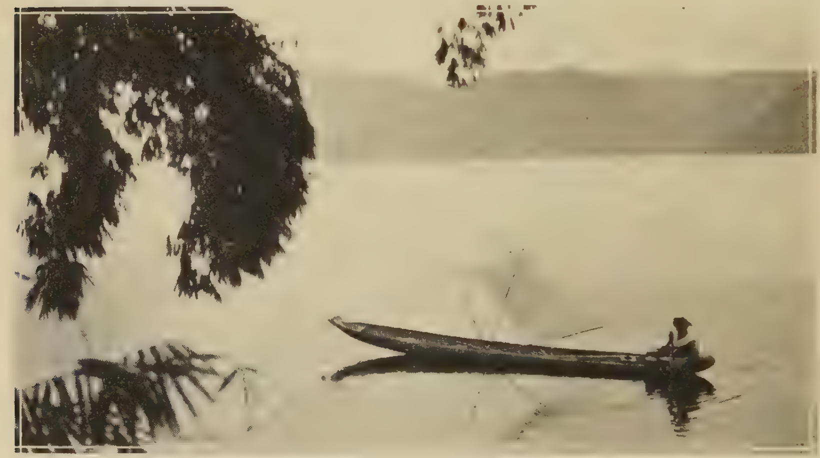
As Mrs. Fairchild and I stood on a pile of logs and waved farewell to the men as they disappeared single file up the mountain side through a gap in the jungle, I felt we were experiencing the great and rather melancholy feeling my great grandparents must have known when they bid good-by to their sons and relatives bound from New England for the great forest area of the Western Reserve. At least the stage setting of the end of a forest trail was there, and the dangers, real or imaginary, were much the same.

With the let-down feeling that comes after seeing friends off, we motored back to the passangrahan and went to work on the seeds and plant specimens. There is something exciting about packing up seeds you have gathered and in which you have great hopes. There is a keen pleasure in gloating over your herbarium specimens as they dry in the blotters; the data must be attached to them, and every morning they must be aired and the blotters changed or they will mold, and while Mrs. Fairchild and I found the task of saving what we had gathered in the jungles no easy one, particularly when we got back to the steaming lowlands and found hundreds of specimens in peril, I think we both look back to the herbarium days in Sumatra with a good deal of sentiment.

The long black log dugouts of the Gayoes tied up to the little wharf looked very inviting and one day we took an oarsman and paddled across in one to the far side of this enchanting Lake Tawar. The dugout has none of the balance of a cayuka on

For much of the way the jungle trail was through such gorgeous scenes as this.

the Chagres, but is more like a birch-bark canoe in its temperament. We got across all right and found ourselves among some of the most peculiar clump bamboos I had seen. Their rhizomes formed great mounds higher than one's head and from the tops of these irregular mounds rose the tall plume-like stems. There were two kinds, the "Bœloe Besar" and the "Bœloe kechil," the large and the small, in other words. It took me some time, even with the help of the Gayo boatman, to get rhizomes of these species for the post. One lot arrived dead, but the other was reported alive when it reached Washington.



A Gayo fisherman in his dugout on the waters of Lake Tawar.

I picked up a local native and he guided me up one of the ravines that led into the pine forest above us, Mrs. Fairchild preferring to remain behind. It was a day that reminded me of Italy. We climbed on and on, my guide muttering something all the time that I could not understand. At last we came to a little clearing in which was a single pine, and under it a tiny thatched hut with a floor made of pebbles from the beach, evidently the grave of some holy man. I saw that my native guide was awed, and I realized that, standing side by side before it, he and I were looking into the same universal mystery and that our feelings were in no way widely different. All the heredity and environment which had been mine gave me no particular advantage over him when it came to the matter of death. He had wondered about it, so had I. He had not been able to solve it, neither had I. The chief difference between us lay in the amount of superstition we accepted. For him the world was full of spirits and ghosts; every accident of his life was due to the machinations of his imaginary world. For me the spirit world, in his sense, had been demolished. I had learned to explain the occurrences about me in another way, which, while not dispelling the mystery, had dispelled the superstition and fear. I have often thought of him, that Gayo guide.

He had a superbly fashioned klawong, mine was a poor cheap thing I had bought of a Chinaman in Takengon, and I think he pitied me. He felt of mine, then he struck the air viciously with his, and I gathered from what little Malay he spoke and I understood, that with his he could fell a man at a blow.

We tarried a few days at Takengon, increasing our collections and also our fondness for that idyllic spot the longer we stayed, and then set off for Medan. As we neared Langsar, we passed through plantations of what I recognized as West African oil palms (*Elæis guineensis*). The immense fruit clusters lying on the ground and the numbered labels everywhere indicated that it was some kind of an experimental plantation where seed selection was going on, but as I could find nobody who was in charge of the plantation, I had to leave without finding out much about it. From what I heard afterwards in Java, and from what I saw in West Africa a year later, I am prepared to believe that the West African oil palm may be the next great industry of the Oriental tropics. Like the date palm, it has the advantage of increasing its yields with age, at least for thirty years. It is adapted to the rainiest regions of the lowlands, and it produces a staple article of commerce for which there is a steady and growing demand. The kernels, as well as the pericarp or fruit flesh, are extremely rich in oil; in fact, the production of oil per acre is double that of the coconut. Over 130,000 tons of the oil and 400,000 tons of the kernels came onto the market in 1916, and by 1922 as many as 28,000 acres had been planted to the palm on the east coast of Sumatra alone. With their characteristic flaire for valuable plantation crops and their unceasing and painstaking investigation of every development, the Dutch have studied the question of artificial pollenation, pruning, seed selection, manuring, in short are making exhaustive researches into all its phases. Figures as high as $200 an acre gross for plantations from their fifth to their thirtieth year are among the estimates of possible returns.[1] What the Oriental plantations did to the Brazilian rubber industry they may do to the West African oil palm industry; capture the market with their product.

Scene in a plantation of West African oil palms (*Elæis guineensis*), near Langsar, Sumatra, where the Dutch are studying this important oil producing crop.

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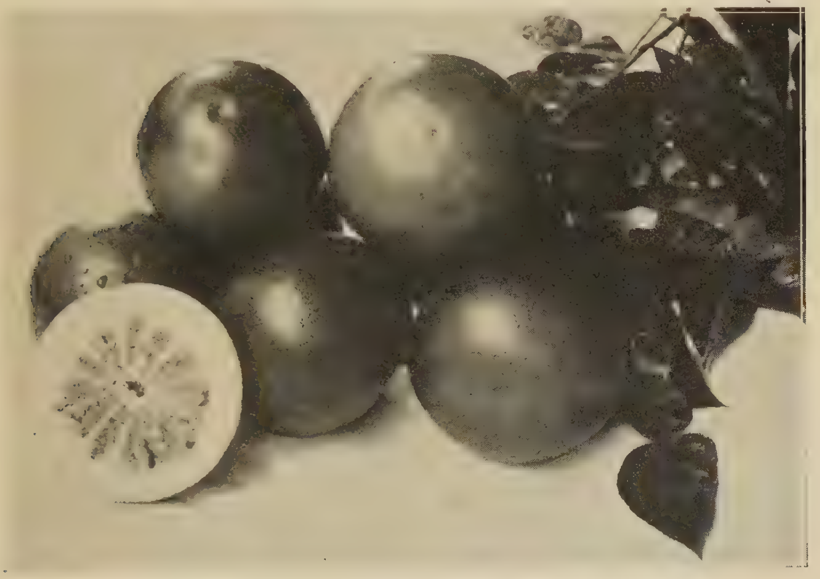
[1] Rutgers, A. A. L., "Investigations on Oil Palms," publication of Experiment Station A.V.R.O.S. Medan, N. I., 1922, p. 111 and Appendix IV (an extensive bibliography is given).

After two hectic days spent in Medan getting off shipments of plants, we got in touch with the owner of a charming little hotel at Kabandjahe, in the Bovenland, a day's run by auto from the Southern end of the trail where the expedition was to arrive. He put at our disposal a little house, once the home of the forester, so we motored up to look at it and found it just what we wanted, and the next day pushed on over a most remarkable road to Koetoe Tjane, which lies in a rainy valley between the mountains where the clouds often hang so low that they resemble drifting masses of fog on the landscape.



Dorsett's wild grapefruit, or shaddock, which he found in the virgin forest near Kota Kenjaran, North Sumatra.

A sharp attack of indigestion during the night prevented my pushing on the following morning, but Mrs. Fairchild met the expedition as it emerged at Lawe Aonau, thirty miles up the valley, and brought the party in, and by evening we were all together, bag and baggage, collections and exposed films, in the forester's house at Kabandjahe. No place could have been better adapted to the purposes of seed packing and plant drying.

Mr. Brandts Buys in his gay kimono telling Jim Dorsett stories of the Atchenese highlands, at the bivouac at Pang Mop, in the mountains of North Sumatra.

The trek had been a success. The natives everywhere had been friendly, and Dorsett, among other interesting finds, had discovered a wild relative of the grapefruit, probably *Citrus hystrix,* and had brought some of the large fruits to show us. It formed a tree thirty feet high and its fruits were 4½ inches through. It is not an edible species, but what its resistance to the many diseases of the grapefruit may be, or what it may contribute in disease resistance to future hybrid citrus varieties, or whether it will prove a valuable stock on which to graft the grapefruit, are all questions whose answers depend on the growth and development of the four tiny seedlings that grew from the only seeds to reach Washington alive.

Interesting tropical acorns, looking in their immature state like green jade, several remarkable species of rubus which grew at an altitude of 5500 feet, representatives of the tropical grape genus Tetrastigma with clusters of blue-black fruit, many species of ficus for the Florida collection of this genus, a tropical euonymus, an extraordinary hydrangea, a superb clerodendron, *Berberis nepalensis* resembling the Oregon mohonia, a stunning celastrus with dark pink fruits, and numerous other interesting plants were brought in by the party.

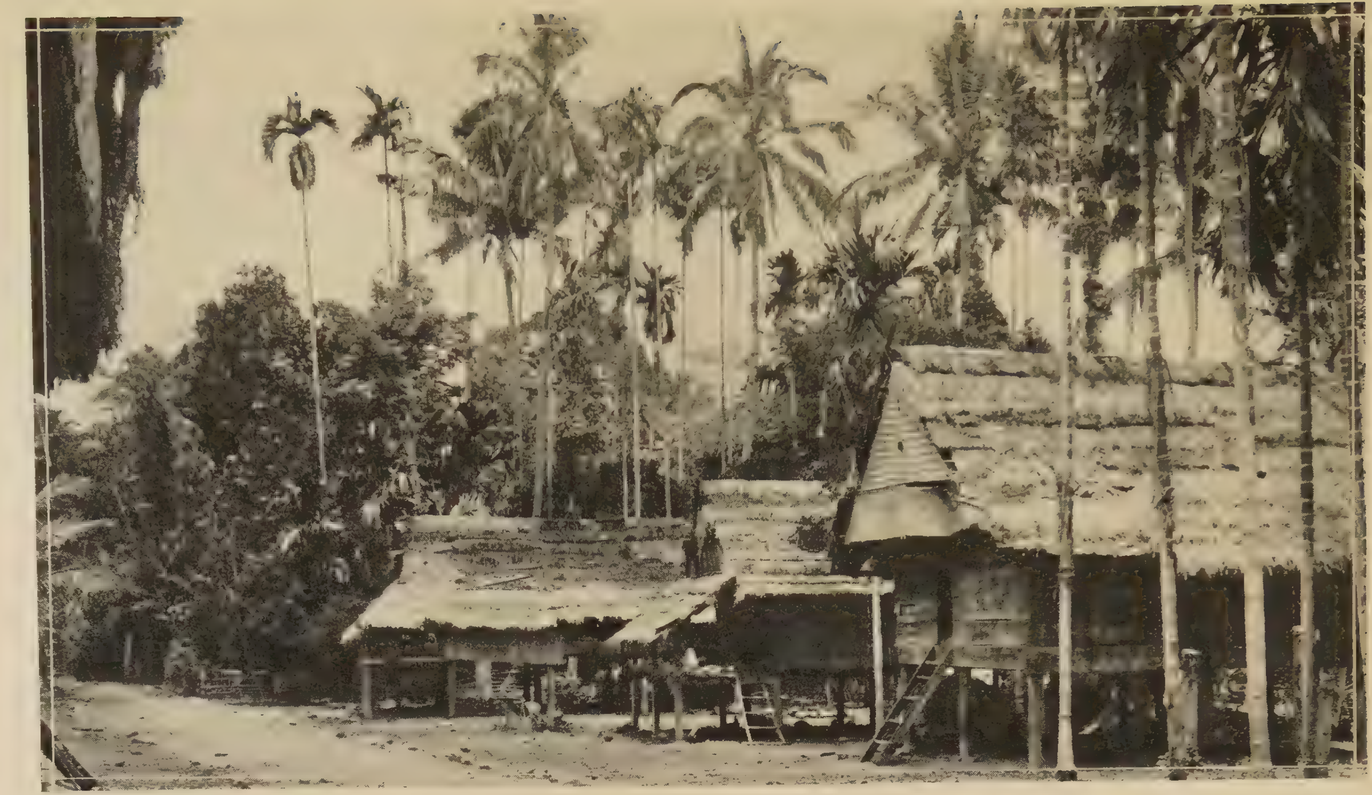
The expedition on a narrow bit of trail through the mountains of North Sumatra.

Graham made a valuable collection of butterflies, found one of the most remarkable of the tropical raspberries and discovered the larvæ of a new species of Lampromya. Jim made a remarkable collection of photographs illustrating the forest and jungle character of the whole "Atjeh Onderhoodigheden," as that portion of North Sumatra is called on the maps of the Dutch Government, and copies of these were presented to the Forestry Department of Sumatra.

Although we tied ourselves down to the task of saving specimens and packing seeds, we took time to have a glimpse of the country about Kabandjahe. It seemed hardly possible that this superb highland region, "Het Bovenland," could have been so recently occupied by European planters. Twelve years before our time a forester had refused to live there because of the cannibalism of the natives, and while this report may have been overdrawn, the very fact that there was such a report seems hardly credible to-day. At Brastagi, about twelve miles from Kabandjahe, we found the modern hotel full of golfers, among the guests as many Britishers from the Malay States and British India as there were Hollanders. Individual mountain villas were building everywhere around it and the whole place wore the aspect of a mountain resort. Because of the million acres of highland to roam over and its drier but quite as invigorating climate, Brastagi has already become a formidable rival of Newara Eliya in Ceylon.

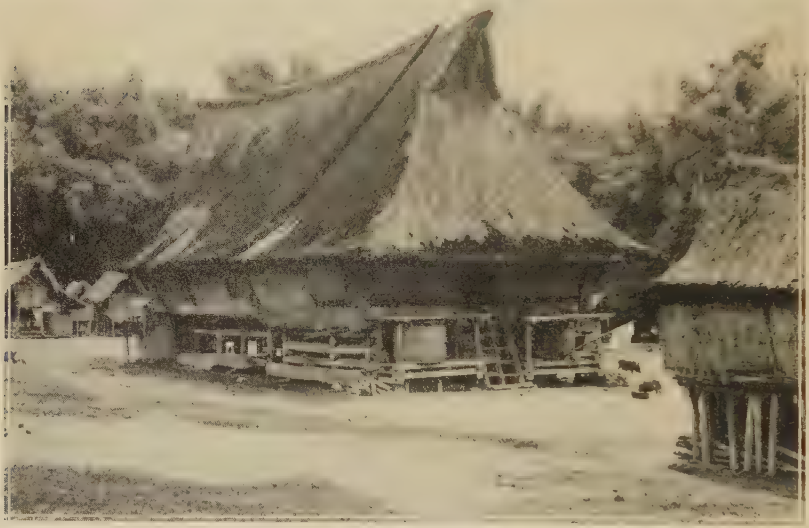
A giant ground orchid which Graham Fairchild found between Kota Kenjaran and Blang Kedjeren in the mountains of Sumatra.

We were in the region of the famous Battaks, and one of their



An Atchenese village in the mountains of North Sumatra near Blang Kedjeren.

characteristic villages was near by. The houses are all built for protection against enemies, standing on piles high above the ground with plenty of room for the pigs underneath. They are securely shut at night and the short ladders leading to the doors are taken up. Indigo is the universal dye of the clothing of Battak women and we saw their dyeing pits down by the stream. They were very crude affairs, just holes made in the rocks in which great bundles of the fresh stems and leaves of the indigo were put, weighted down with stones, soaked with water, and left to ferment. They seemed to be community affairs as far as we could see. Primitive looms were in use everywhere, but the weaving done on them was very fine and the designs were often beautiful, each village seeming to have its own distinctive patterns. Mrs. Fairchild, who is much interested in the Javanese batik method of dyeing fabrics, was disappointed to find that there



This little Battak village was quite surrounded by a living fence of bamboo. The community house in the center, like most Battak houses, has a picturesque gabled roof of thatch, quite different from those of the Atchenese houses.

is no more connection between batik and Battak than a similarity of names.

I wonder if any anthropologist has worked out the origin of the remarkable roofs of the Battak houses. Who were the architects and how did they start a style with so much that is graceful and original in the sweep of the roof lines and the proportions of the gables? I can only compare their beauty with that of the gracefully made wasp's nest one sees in the barn, or the hanging oriole's nest in the orchard.

The native Battak houses are made of bamboo, and Mr. Dorsett and Mrs. Fairchild found the technique used in the framework very interesting.

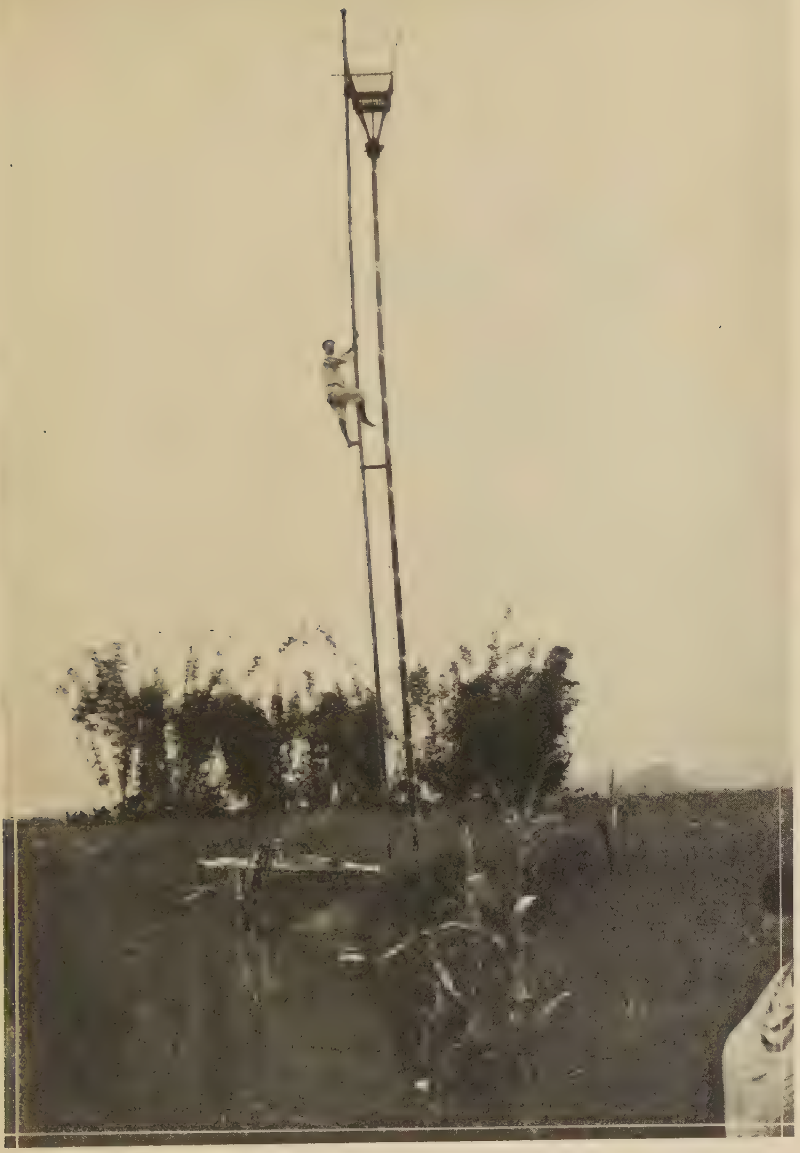
One of these villages we found completely surrounded by a thick living hedge of bamboo, the masses of whose rhizomes rose as high as our heads before the tall culms were produced. These culms were everywhere in use as structural portions of the houses and if one were to take the bamboo away from the Battak, his civilization would collapse like a house of cards.

As we were returning one evening from a trip, we passed what

I am sure are the most remarkable scarecrows in the world. Birds are one of the greatest pests of the paddy fields and wherever one goes in rice growing countries, one finds all sorts of contrivances for scaring the flocks of rice birds away. The Battak makes his entirely of bamboo. He digs a hole six feet deep and plants firmly in it a six-inch bamboo pole twenty to twenty-five feet long, setting it perfectly upright. He makes a basket-like pulpit strong enough to hold a man, and leaves about fifty of the strong elastic bamboo strands with their loose ends sticking up, as though the basket were unfinished. This is fastened on the top of the pole before it is set in the ground. A second pole with notches in each joint to serve as steps is planted a short distance away from the pulpit pole and fastened to it. To each of the loose ends of the pulpit-basket is attached a long thin bamboo twine, the other end being fastened to a stake at the border of the rice field which it is desired to protect. This bamboo scaring twine hangs in a gentle curve above the ripening rice, and the fifty are so spaced that they cover the entire field. During the daytime a scarecrow operator sits always in the pulpit and shakes the string nearest to any flock of birds that may alight on the rice, frightening them away. When we passed, the sun was setting, the birds had gone to roost and the man was just descending from his watch.

The weeks had flown, spring was coming, and Manchuria would soon be calling the Dorsetts. We had the alternative before us of staying in Sumatra or going to Java. We chose the latter course, because the older civilization offered much more for the purposes of the expedition's quest than the wild jungles whose riches are only to be dug out by long sojourns at various and scattered headquarters.

Our last excursion was to the Toba Lake at Harangaol. In the guide books of the late nineties this remarkable lake is dismissed with a brief paragraph saying the trip from Deli to Lake Toba is not dangerous. To-day it is within a day's journey by



A scarecrow operator climbing the bamboo ladder into the bamboo pulpit from which he can see the rice field he is protecting. Unfortunately the radiating strings were too fine to show in the photograph.

auto of Medan, and already charming little hotels are clustering around its shores.

Once out on the Bovenland, the fact begins to dawn upon you that you are in one of the most amazing places in the world. Your eye sweeps a far horizon as it does on the plains of Montana, but here innumerable volcanic peaks rise around you and your car is traveling forever along the border of some deep ravine, filled to overflowing with the crowns of giant tropical forest trees.

In an area forty miles square, with Kabandjahe as a center, there appear on the map fifteen streams such as those you are just skirting, all so far below that the water can neither be seen nor heard, while the twelve volcanic peaks, some of which are smoking, range in height from 4000 to 8000 feet above the sea. Let the tourist-laden aeroplanes once land upon it and who can say what will result? I predict it may become the greatest health resort in the whole tropical world, attracting to it the wealthy winter golfers of Europe and the sunburned summer golfers of Australia. A million-acre winter and summer play place, surrounded by fascinating tropical jungles at an altitude of three thousand feet is something to attract the crowded aerial craft of the future.

As we were driving through these marvelous highlands, getting out every few minutes to collect leguminous plants or grasses, or trying, often in vain, to reach fruits that were tantalizingly near us in the tops of the trees which rose from the ravines by the side of the road, suddenly Toba Lake came into view. It is larger than the lake of Geneva, with an island in its middle that is twenty-five miles long and its mountainous sides are clothed with a vegetation it would take a botanist a lifetime to describe. We drove down the winding road to the shore, gathering plants as we went. Once I brushed against the recurved spines of a vine, *Cesalpinia sepiaria,* and was brought to a standstill. For a moment I seemed to be on the keys of Florida among the knicker beans again, and indeed this was a relative, with much the same habit.

When we reached the lake there was an idyllic beach on which some wealthy Hollander had built a rather pretentious house to which he could come to get cool. On the beach I found a legume which I took to be a *Crotalaria,* that had the largest number of seed pods on it I had ever seen on any legume. We found another one beside the road which turned out to be *Crotalaria striata,* a species which was introduced into Florida twenty years ago. It is to-day one of the most valuable cover plants ever brought into that state. According to Prof. Stokes, who has been studying it for several years, it is "a soil building crop for poor, thin, sandy land, being a good seeder, a rank grower, free from serious diseases, and when turned back to the soil, a crop which adds large amounts of nitrogen to it. Both A. Zimmerman of Amani, German East Africa, who sent the seeds to America, and C. V. Piper of Washington, who introduced it, must have been pleased that from a handful of seed, vast fields of the legume are enriching the soil of Florida each year. Can anyone build himself a better monument than this?

The water was too inviting for Dorsett and me to resist and we found it as refreshing to swim in as it was beautiful to look at. Some day we would like nothing better than to spend a month on the shores of the Toba Lake, collecting.

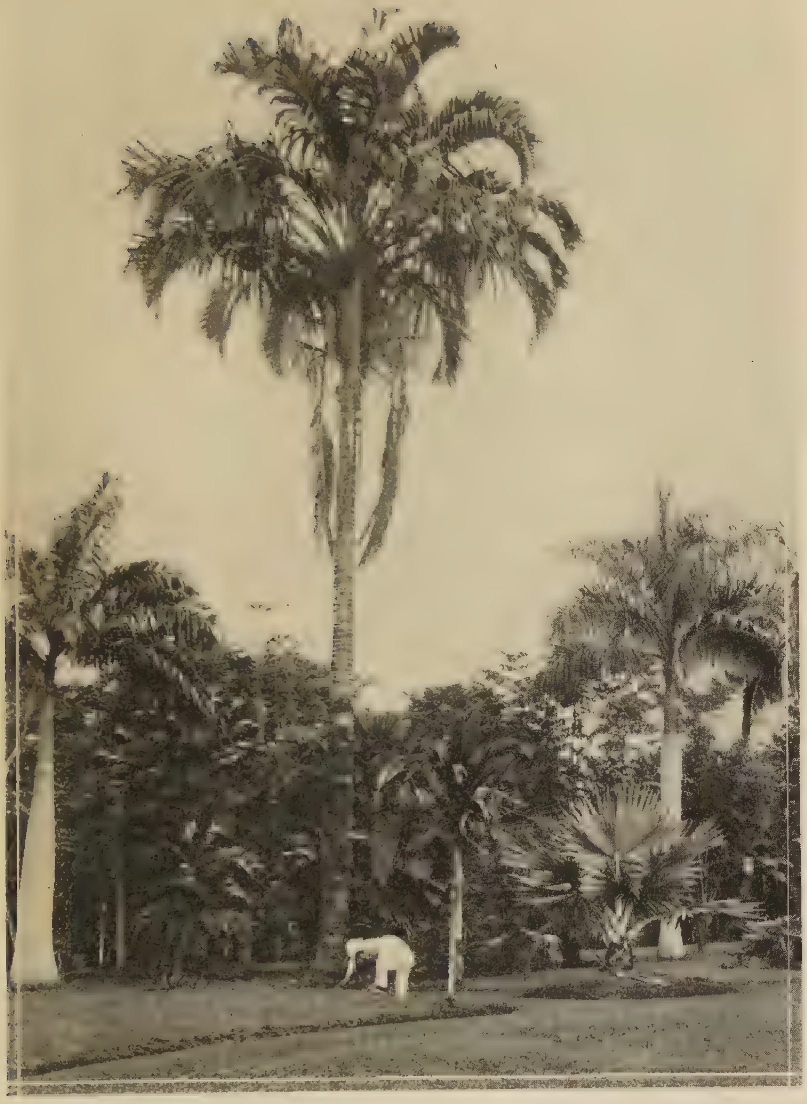
CHAPTER XXVIII

THE SIBOLANGIT GARDEN

WHEN we first came to Sumatra, we were told of a Plant Garden halfway between Medan and Brastagi at an altitude of 1600 feet and we had stopped there on our way up. Its director, Mr. J. A. Loerzing, had received us with great cordiality and showed us over its incomparable trails, for in place of being a botanic garden of the conventional type, it was a real jungle garden teeming with things of fascinating interest to us. Mr. Loerzing was a real enthusiast, and had gathered together a small herbarium and a library, and had acquired a wide acquaintance with the flora of Sumatra. There was a little guest-house, where visiting botanists were welcome, and he had invited us to come and stay there when we finished the trek through the jungle, so on leaving Kabandjahe, Dorsett and I took our specimens and notes and established ourselves there for several days. We had two wardian cases sent up from Medan, and filled them with plants, many of which are now growing in gardens in the Western Hemisphere. With Mr. Loerzing's help, we were also able to determine many of our specimens collected in Atcheen.

Things have since gone badly with its director, I hear, and the management has been put in other hands. I trust that the government will find it possible to build up this station, keeping its unique charm as a jungle garden, and that botanists from all over the world will continue to find a welcome there, for it deserves to be better known to the world.

Of the many rare and interesting plants which we secured at Sibolangit, the Moluccan rattan palm (*Pigafettia elata*) stands out clearly in my memory for, though only six and a half years



Collecting seeds of the rattan palm (*Pigafettia elata*) at Sibolangit. This tree was only six and one-half years old but it towered sixty feet in the air, far above the royal palms on either side of it that were planted at the same time. Unfortunately no seeds of this palm have arrived in America alive.

old, its great spreading fronds were tossing in the wind sixty feet above our heads. As we saw it in Sibolangit, it seemed as stately as the royal palm and twice as rapid a grower, and the straight, cylindrical stem is a beautiful brilliant green for the upper third of its height. A handsome wild banana (*Musa glauca*) with enlarged base, and leaf stalks of a light bluish gray tinge, was new to me, and if its growth in Florida compares with that in Sumatra, it can scarcely fail to make a place for itself among the stately ornamentals of the gardens there.[1] I saw for the first time the long-jointed bamboo, with nodes five feet apart, out of which the Battaks make their blowguns. It is also from the thin-walled stems of this species that the musicians of the Javanese kampongs make the bamboo pipes with which they fill the moonlight nights with a strange sad music. We planted two wardian cases with some of the rare bamboos so much used by the Battaks and of which the Western Hemisphere seems to be ignorant, such as *Schizostachyum brachycladum, Melocanna humilis* and *Schizostachyum latifolium.* We also put in relatives of the bread fruit, *Artocarpus elastica,* and an undescribed species called "roepas" by the natives, who cook and eat it as the Pacific Islanders do the breadfruit. *Turpinia pomifera* was a wonderfully fragrant flowering tree; *Eugenia aquea* was one of the showiest fruiting trees I ever saw, with small pear-shaped translucent crimson fruits scattered by thousands over it; *Actinorhytis calapparia* is a palm ideally suited for small gardens, where its slender graceful trunks would make beautiful miniature avenues; and the fast-growing tree *Alangium begoniifolium* var. *tomentosum,* grown for poles, with a brief life period, like the papaya, may find a place in the agriculture of Central America, and possibly too in South Florida. The most curious tree of the whole garden was the bird-catching tree, *Pisonia excelsa,* whose

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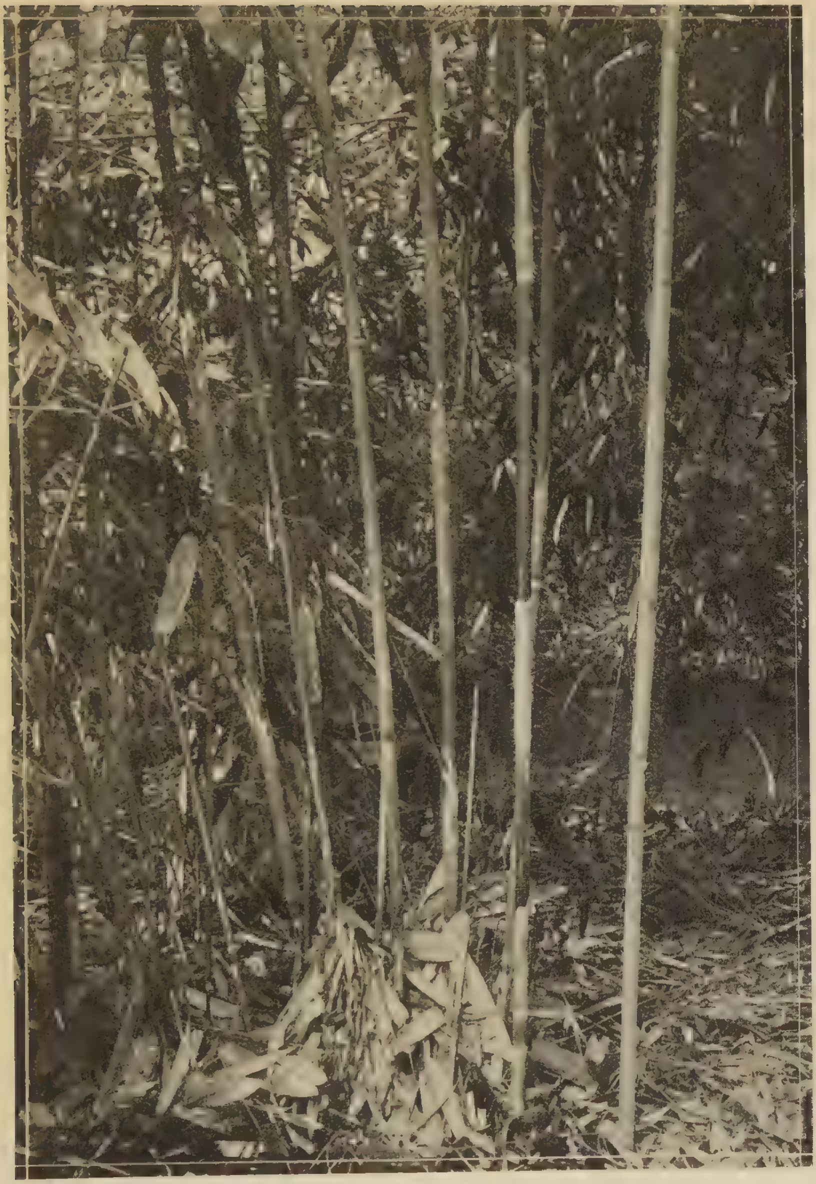
[1] It has grown well in my garden in Coconut Grove and fruited there; indeed, I already have second generation plants, but it is not as graceful as in Sumatra. It may prove a good fiber plant.



The slender, long-jointed bamboo of Sumatra (*Melocanna humilis*) from which the Battaks make their blow guns and the Javanese their flutes.

fruits are covered with a gum that is as sticky as glue. Small birds that alight on it when the fruits are ripe get their wings so glued together that they cannot fly and often fall to the ground below. Unfortunately we were there before the fruit was ripe.

Botanizing in the plant garden of Sibolangit, Sumatra, took us over this narrow causeway covered with tropical ferns which concealed the sheer precipices on either side.

Ever since my first visit to Java I have wanted to introduce somewhere into the western tropics the most curious of all the tropical cucurbits, *Macrozanonia macrocarpa.* The tiny seedlings of this vine start life with a slender stem and leaves no larger than that of the smallest *Ficus pumila.* Clinging to the bark of the nearest tree, this tiny thing grows up into the large branches of the tree and there the leaves become larger just as they do in the case of the climbing ficus, but still it clings and goes on up. When the vine finally reaches the tops of the forest trees, its leaves enlarge enormously until they are a thousand times or more the size they were when young. The fruit borne in the tree tops is as large as a pumpkin, and when it ripens, a square hole opens in the bottom and, with each gust of wind, there escape hundreds of the most perfect flying or rather soaring seeds I have ever seen. I once imported one of these gourds full of its seeds for Mr. Graham Bell to experiment with in the days when he was working with his kites. The seeds seem to be short-lived but I found a single plant for the wardian case.

We spent some fascinating days with Mr. Loerzing, following him up and down over the trails—by no means always safe—of his garden. A tropical *Mucuna* has stinging hairs on its pods, so poisonous that to brush against them is agony; the native *Laportea* is a nettle so vicious that to fall among its leafy stems would drive one almost insane, while the possibility of meeting a cobra or a green viper made one cautious about where one walked.

The monkeys chattered from the tree tops. The most amazing chorus of tropical birds used to awaken us at dawn. The shrill scream of great green-banded cicadas was earsplitting. The sound of water coursing down the pebble-lined waterways through the garden and the hum of insects at night, all come back to me as I write. How I should love to stand once more at moonlight on the cliff near the guest-house in Sibolangit and look out over the great tree-ferns across the sleeping valley filled with its thousands of species of living forms, the virgin tropical forest!

CHAPTER XXIX

JAVA AT LAST

MEDAN felt hot after Sibolangit, although the thermometer registered only 91° F. in the middle of the day and 71° F. at night. This is what they call very warm weather in Medan in March.

After several hectic days getting off wardian cases, arranging for the re-issuing of a letter of credit which had been lost somewhere between London and Ceylon, making our final calls and getting the car onto the boat, we found ourselves, on the first of April, sailing out of Balawan in one of the most luxuriously comfortable and attractive vessels it has ever been my fortune to sail on, the Steamer "Plancius." In place of the portholes in the main lounge, she had solid plateglass windows from ceiling to floor, and she was otherwise equipped in exquisite taste, with a Chinese motif running through everything. So this was one of the passenger boats of the Java Sea! I could scarcely believe that the luxury in steamers in this far-away part of the world had outstripped so completely the shipping on the Potomac or even that of the great White Fleet of the United Fruit Company. Then I heard that a sister ship had been named after the great Rumphius, and another after my distinguished friend Melchoir Treub, who, when I had last seen him, was sitting beside his microscope studying the latest microtome sections I had made for him, sections through the flowers of a unique saprophytic plant (*Balanophora*) that occurs in the mountain forest of Java. It can truly be said of the Hollanders that they have done honor to their scientific men.

Although I had been prepared for the traffic police in Batavia, I could not shake off my memories of the sleepy dream place I had known in the nineties. True, there is still the picturesque canal at which the poorer people wash their sarongs as of old, and here and there I saw the familiar bamboo cottage beneath the palms, but the streets are broad, the electric trolley looked immense and the whole scale of things had changed. The Java of the nineties has gone, and a new Java has taken its place. I will not say a better one, for to me Java always seemed to have more romantic beauty than any other spot on earth. How much the change was in me, and how much in Java, I could not say.

Instead of slipping into a little "Dos-à-dos" and saying glibly to its driver "Piggi di rœma makan," we spent an hour with the customs officials waiting for our car and then motored to the hotel. The great trees which used to shade the rooms are gone, and while the separate bungalows remained, to me much of the charm has vanished with prosperity and the tourist trade. Still, before the door of each bungalow verandah there stood a beautiful palm which, were it on the lawn of a Miami millionaire, would draw the visitors from all around to see its beauty, *Chrysalidocarpus lutescens* from Madagascar, a species which grows well in Florida but where large specimens are still rare.

Ever since my first stay in Java I have been telling my friends about the Javanese rijstaafel. I even introduced it into the family circle where a number of my colleagues and I used to dine and to this day it has persisted, I understand. It is a real institution, not merely another dish. At last Mrs. Fairchild and Graham were to have a real rijstaafel; they had often had imitation ones at home. As soon as you sit down at table the waiter enquires "Will you have the rijstaafel, or will you have the regular lunch?" I think some robust digestions take both, but I never have been able to. He signals the "mandoer" of the rijstaafel and immediately there arrives at your elbow a waiter who gives you a soup plate while another invites you to fill your plate from an immense bowl of rice, rice that does not stick together like bits of glue but tumbles out in a light airy mass. Behind the rice waiter in his mangosteen brown turban and white suit stands a waiter with a bowl of the hottest, most aromatic curry sauce imaginable, for you to pour over the rice. Back of him comes another waiter with fried eggs, back of him one with chicken croquettes, behind him one with fried plantains, then another with fried eggplant, one with broiled chicken, and after him what seems like an endless string of waiters with pickled corn, browned grated coconut, browned almonds or peanuts, little red fish like anchovies, Bombay duck, which is nothing less than dried rotten fish, wonderful translucent crisp crackers made of turtle's eggs, fresh sliced cucumbers, mixed pickles, and last, the chutneys. These chutneys give the finishing touches for they are not the modified, sweetened, mild chutneys the corner grocer sells in America. They are HOT!! The discoverer of Bengal Club Chutney was, I suppose, some bon vivant who found himself languishing in India, but he has immortalized himself in a sauce that is about the hottest, most all-pervading, perspiration-producing stuff mankind ever took into its alimentary canal. It has the bite of McIlhenny's Tabasco, but a smoothness that is so insinuating that you are led to take more into your mouth than you find soon afterward you really want.

After taking samples from some, or, if you wish, all of these dishes offered you by the string of noiseless barefooted waiters, your plate is full, very full, and you begin to mix the contents up, but not too thoroughly, for you want each spoonful to have an individuality of its own. One may have plantain as its distinctive character, the next fried egg, the third broiled chicken, the fourth croquette, but all will have a rice base. It is the varied character of the rijstaafel that makes it so amusing and interesting. It is a departure from the usual set table formulas of civilized man, and I have always resented the ridicule that the unthinking traveler casts upon it. After one has compared it with some of the utterly nondescript meals one gets throughout America in midsummer when the weather is too hot to eat anyway, one longs for the appetizing tang of the rijstaafel of Java, regardless of what the wise dieteticians say about its injury to one's interior decorations.

Here we were in Java, the Mecca Mrs. Fairchild and I had dreamed of ever since we were married, but the maddening part was that we had been obliged to decide, before we got to Java, the date of our departure. Every steamer for months ahead was crowded with the summer home-travelers, and it was either cut our stay to six weeks or stay over until the next season. The Southwest Monsoon was coming on, during which season steamers are few, for the hurricanes in the Bay of Bengal are quite as terrible as any that ever visit the West Indies, and the Indian Ocean becomes a seething storm-driven region.

Also, the Manchurian contingent of our party had left its collecting work unfinished and must return there to be on hand for the spring collecting, and the only steamer which could get them there in time left in less than a month.

I had been twice before in Java. Once when I was studying the fungus gardens of the white ants and spent most of my days for eight months with my head in some one of their nests in the ground, from which study Mr. Lathrop had dragged me away to Sumatra and Australia, and again in 1899 when Mr. Lathrop and I had rushed through the island on our way to New Guinea. Neither of these times had I really seen Java, but I fear that if I went there again and stayed a year I could not see it, for how can one thoroughly see such a land? It is true that Java is only half again as large as Ireland, but it has more volcanoes in it than has any other spot of similar size on the earth, thirty-eight or so, many of them ten thousand feet high. It has thirty-five million inhabitants and yet has jungles where the tigers and the rhinoceros, the black panther and the wild benteng roam. It has more species of trees than there are in the whole United States; a complete flora of Java would be quite as voluminous as Gray's Manual.

It has remarkable forms of life such as flying lizards, and plants like the Rafflesia, not found outside the archipelago. Its insects are multitudinous, most wonderful in form and imitative or protective coloring, and it has some of the greatest ruined temples of antiquity, covering more ground than the great pyramids of Egypt. It is also the active civilized European center of that vast mass of islands, stretching 4000 miles along the Equator, with an area as great as Western Europe, which is called the Malay Archipelago. In it some fifty or so millions of people live who speak collectively over thirty different languages. Java is not only the most remarkable tropical island in the world, but it is the one which best introduces you to the incredible wealth of variety of living forms gathered about the Java Sea.

No one can go to Java and not be bewildered by the variety there. I knew this and determined that we could do nothing better than to concentrate as much as possible on the relatives of the mangosteen, the mangoes, and the Javanese bamboos.

While Batavia is the metropolis, Buitenzorg is the scientific center of Netherlands India, and there one finds the museums, laboratories, libraries, and the famous Botanic Gardens, and so to Buitenzorg we went as soon as possible, to the Hotel Bellevue, whose modest back verandahs look out on one of the famous tropical scenes of the world. This at least had not changed. There was the smoking volcano, the Salak; there was the same swift-flowing river, with men and women and children bathing in it. There were the same coconut palms and the tangle of tropical vegetation stretching to the slopes of the Salak. Even the well-remembered piping of the bamboo flutes drifted up to me as I sat there. I could not help thinking of the time, thirty years before, when the Lathrops entertained me on that same verandah and the plans of travel were made which led to years of wandering with Barbour Lathrop and eventually to the origination of the Plant Introduction Work of the Department of Agriculture in Washington.

We had intended to call at once on the director of the Botanic Garden, Dr. Docters von Leeuwen, but found he was just leaving for New Guinea with Dr. Stirling of the Smithsonian Institution to explore the unknown rivers of that immense island.

It is interesting to think that three centuries ago, in a little town on the river Main, a carpenter's son was born who was crazy for adventure and who set out as a midshipman for Brazil. By the merest accident of fate, he was diverted to the Malay Archipelago which was then known in the courts of Europe, chiefly as being the home of the nutmeg and the clove. This boy, solely because he loved above everything else to see and study natural objects and write down what he saw, from his little thatched house in the Island of Amboina kindled an interest in the plants and animals of the tropics, and published the most remarkable book on plants which had ever been written, years before the Swedish genius, Linnæus, got out his Species Plantarum.

The story of Rumphius is a romance which every boy should know. Born of German parents in the little town of Hanau on the Main in 1628, he first appears as a vigorous young employee of twenty-five, of the Dutch East India Company, landing in 1653 in the spice island of Amboina. For seventeen years he collected and studied the strange living plants and animals of his immediate surroundings, hoarding them and gloating over them as would a magpie. He did this while earning his stipend of sixty guilders a month, now approximately $24.00, but amounting to more at that time. After seventeen years of work, much of it by the light of dim lamps and candles, he became blind, but nothing daunted, he still kept on, getting others to do his drawing and writing for him. Four years later an earthquake killed his wife and daughter, on whom he depended for assistance. But still he worked on. Thirteen years later a fire destroyed the Dutch Quarter in Amboina and with it the original sketches he had made before he became blind. Doggedly he kept on for fifteen more years, by this time having won the respect and support of the officials of the great company and of the Government, who placed with him assistants and artists. The first volumes of his original book went down in the steamer "Waterland" which was sunk by a "Frenchman" while on its way to Holland, but luckily, through the Governor General's order, a copy had been kept in Batavia. From this another copy was made by hand, which took another four years. This arrived safely in Holland, where it created favorable comment but where it, as well as the other volumes of his remarkable work, waited over fifty years before anyone could be found who felt that they warranted the expense of publication. Yet when the manuscript did appear in print in 1741, it took rank as the most remarkable book of its time, containing the original descriptions of hundreds of new species of plants and animals, descriptions that stand to-day, models of accuracy and care. This story seems very much of a digression, but as we talked with Stirling and

The Treub Laboratorium in the Botanic Garden of Buitenzorg was erected in memory of the great man who started the research institutions of tropical agriculture in Java. It is open to research students from all parts of the world.

The lily pond of the Buitenzorg Garden, with its background of marvelous palms.

heard him tell of his plans, I realized that here, three centuries after Rumphius, moving-picture cameras and airplanes were trying to do what this blind man did all alone in his thatched cottage in the tiny island of Amboina, show to the world the beauties of the tropical forms of life.

Buitenzorg itself has changed, as I soon found next morning when I went into the "Kabon Besar" or "s'Lands Plantetuin" as the Botanic Garden is called. The close planting of the trees necessary in order to accommodate the thousands of species, has given the garden a truly tropical forest effect, but has thrown the flowers out of sight above one's head. The spotless new laboratory for foreign students, dedicated to Treub, was almost empty and I missed the old one with its tables filled with workers from different countries. However, there are many other and larger and finer special laboratories and museums for the staff, and in place of the small staff of those days, there is now a bewildering number of specialists, just as there are now thousands of workers in the Department of Agriculture in Washington in place of the few hundreds of the same earlier period.

I had a feeling as though the great garden had been left behind and was no longer the growing, expanding thing it had been when Treub was at its head and expeditions were reaching out all over the world after interesting trees. But where could they plant new trees anyway? The 205 or so acres are already fully planted and the funds are needed for researches which may yield more immediate returns. The day of the great arboretum was past, the day of the specialist had come. In building the little tobacco and coffee laboratories, Treub started a greater institution, the Department of Agriculture, but he did not provide largely enough for the growth and maintenance of the arboretum. But I must not criticize, for my own government has been the tardiest of them all in building arboreta.

When the Superintendent, Mr. Dakkus, informed me that he had 120 men at work in the gardens, that the highest wage was only $16.00 a month and his monthly payroll only $400 and that with this expenditure of, let us say $5,000 a year for labor, he and his assistants were able to give all the care that is needed to 10,000 species of plants, 3000 of which were orchids, I could not but be staggered. I could not help thinking of Florida, where I pay one colored man what his five best trained native gardeners get and pay common labor ten times what his boys receive for the same type of work. I wonder if there is any place in the world where a great garden can be maintained for as little as it can be in Java? I doubt it, for labor is not only cheap but skilled, indeed old Mantri Œdam, on whom thirty years ago Dr. Treub pinned the Silver Star of Merit, was a more clever plantsman than some of the botanists I have met in my travels.

The Hotel Bellevue, in Buitenzorg, has been a meeting place of scientific plant travelers from all over the globe for forty years or more. Pemberton from Hawaii (left), Taylor from Fiji (right), and Fairchild from Washington enjoyed many a talk on the verandah, which overlooks one of the most superb landscapes in the world.

We were soon in the midst of interesting personalities, men who were digging into the secrets of the great world around them, and it is to such delightful and interesting scientists as Dr. Cramer, Dr. Koch, Dr. Beumée, Dr. Dammerman, Dr. Heyne, Mr. Ochse, Mr. Keuchenius, and Mr. Dakkus, and Mr. Wichman, Jr., that we owe many unforgettable courtesies and much valuable plant material.

At the hotel too, there were interesting persons. C. E. Pemberton from the Hawaiian Sugar Planters Association, on a quest for the parasites of the sugar cane borer, and T. H. C. Taylor from the Fiji Islands, hunting for a parasite that might keep in check the destructive moth whose caterpillars destroy the coconut palm leaves. Buitenzorg is to-day an active center.

It was in Java that I had first made the acquaintance of the mangosteen and I wondered what its status would be after thirty years, but I found it had not changed. It is not grown anywhere in Java as an orchard crop; there are nowhere more than a few trees planted together, and these mostly in the "kampongs" or native villages.

I could hear of no such thing as canned mangosteens, though a friend of mine, Harry Boyle, once sent me a case of canned mangosteens from the little island of Solo in the Philippines, which I thought perfectly delicious.

Apparently there are no varieties of the mangosteen, for seedling trees everywhere bear curiously uniform fruits. No such thing as a grafted specimen is to be heard of. And why should there be if the fruit comes true to seed? I visited the section in the gardens where all the relatives of the mangosteen are growing, the "Guttiferæ." The specimens were all great forest trees, and even a glimpse at their flowers was attended with great difficulty. I turned to the Economic Plant Museum that Dr. Heyne has so wonderfully built up, and there in great jars were the well-preserved fruits of the most interesting forms of garcinia which have fruited in the gardens. There was *Garcinia celebica,* L., of which I had seen a specimen in Kew, *Garcinia dulcis,* Kurz, which I later saw on the trees in Singapore, *Garcinia nervosa,* Greshoff, a species with enormous leaves, which I had seen at Sibolangit and which grows wild in Palembang, Sumatra. The orange-sized fruits of *Garcinia macrophylla,* Miq., also with very large leaves, were there, and a small fruited species, *G. parvifolia,* var. *longipedicellata,* Boerlage. Regarding their edibility, of none of these could I get any definite information, further than that like *Garcinia xanthochymus* they are extremely sour. I should have liked to have taken cuttings of these species and rooted them in the wardian cases with bottom heat, which we had fitted up on the Utowana, but, alas, by this time she was tied up to the quay at Naples.

CHAPTER XXX

THE BAMBOO CIVILIZATION OF JAVA

I HAVE studied bamboos at various times in Japan and China, Ceylon and Sumatra, Cochin China and Siam, and the Philippines, but nowhere is there such a universal use of the bamboo to be found as in the island of Java. There it is the chief building material of 35,000,000 people. If it were possible to take away from the Javanese everything they have that is made of bamboo, there would be scarcely a house standing, no fences, few bridges save those put in by the Dutch, no chairs or benches to sit on, no baskets to carry anything with, no poles on which to carry the bundles of paddy, no hats to wear, no water buckets, no way of preventing erosion in the torrential streams, no bird cages, no scarecrows, no baskets to protect the fruit, no cages under which to grow young seedlings where the birds cannot get them, no coverings for the carts, no ladders, and no beds to sleep on. Take away the bamboo from our civilization and we would simply have to go fishing with some other kind of a rod; that would be about all.

Jim was aching to turn his movie camera on this world of bamboos, and I to have him, so we began one afternoon with the fences. Americans live so much of their lives surrounded by barbed wire fences that they forget how completely and unalterably ugly a barbed wire fence is. Let them go to Java and see how many beautiful forms of fences can be made out of the strips of pliable and incredibly tough material of which a bamboo cane is made; I should say there were almost as many as there are types of the hooked rugs which are so much the fashion to-day.

The study of these bamboos soon became the "leitmotif" so to speak, of our hunt in Java. There are many species in the Garden and we arranged for the sending of such of these as we believed should find a home in the Western tropics, for there are many forms of these genera of giant grasses which would be of little value. Some of them are blessed with spines for their protection that would discourage even the builder of a barbed wire fence. Some of them are too crooked to invite anyone to try to use them. Others have wood that is too brittle, and so the selection goes on until you have narrowed down the number of really superb bamboos in Java to only five. Two of these one finds growing in almost every dooryard, the "Betong"[1] and the "Tali,"[2] and of all the clump bamboos I have ever seen, these two are by far the most valuable for the rainy tropics. Because of their absolute freedom from spines, their straightness, the stems arising without the annoying curve which most clump bamboos have, their convenient size, and the durability of

Compare the artistic quality of this picture of a Javanese baby peeking over a bamboo fence with one of an American baby looking through almost any of our fences, especially a wire one.

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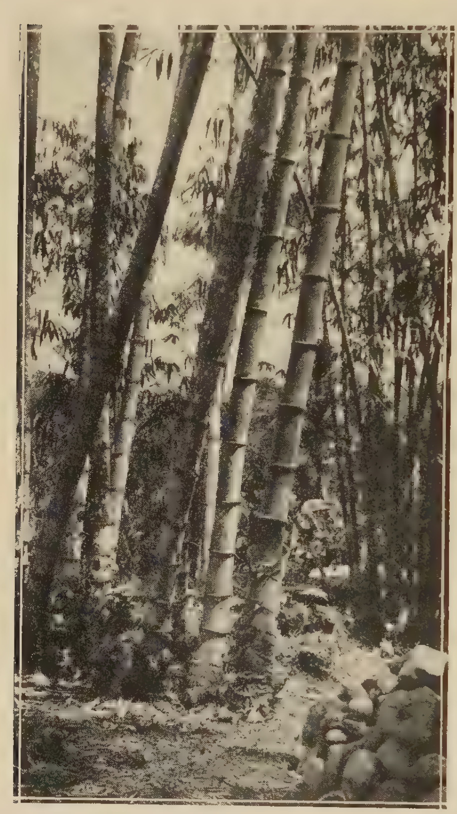
[1] In Javanese *"Awi Citoeng,"* in Sundanese *"Boelo Coloeng"* or *"Betong."* (*Gigantochloa asper,* Backer.)

[2] In Javanese called *"Awi Tali,"* but in Sundanese *"Bamboe Tali."* (*Gigantochloa apus,* Kurz.)

their wood, they are economic plants of the very first importance for the other tropical regions of the world. It is an amazing circumstance that so little attention has been called to these bamboos, that nowhere, so far as I am aware, have they been really introduced into the tropical regions of other countries. They may be tucked away in botanic gardens, but the growing of a specimen tree does not constitute an introduction, in the sense in which I use the word. The new plant must become the property of at least a few private individuals who have begun to utilize it before it can be classed as a really introduced species.


The two most valuable bamboos in Java; the larger "betong" in the foreground with the slimmer "tali" behind it at the right, Neither of these bamboos has the short annoying side branches which make many of the other varieties so difficult to work.

I could not find that either of these species produces seeds, although they both are reported to bloom and the rhizomes to die after the blooming is over. The wardian case method of propagation from rhizomes will probably be the only one by which these finest of all bamboos can be distributed throughout the tropical regions of the world. The betong furnishes edible shoots, is in fact the favorite species as a vegetable; the tali has bitter shoots that have to be especially cooked before they are palatable.

Of the other three species, both the long-jointed bamboo *Melocanna humilis* from which the beautiful Javanese flutes are made, and the "Andong" (*Gigantochloa verticillata,* Munro.) which, in the lowlands, takes the place of the hill-loving betong but is not so durable, are found in the rainier regions of West Java. The "Bamboe Doeri" (*Bambusa bambos,* Backer) takes the place in East Java of both the betong and the andong because, so Dr. Backer says, it drops its leaves and in this way resists the terrible drouths of that region, where in some years the rain never falls for six months at a time, and great cracks open in the compact clay soils.

From the appearance of these commoner species and the fact that there are recognized varieties to which the clever Javanese have given distinctive names, I am led to the conclusion that in Java there are cultural strains of bamboo which differ in the strength of their fibers as well as in the ease with which they can be split and even in the size of their stems. They are most certainly worthy of the serious study of some one who can devote a year or so to their classification and life history. They are among the most interesting of plants.

A vigorous young plant of the Javanese "tali" bamboo (*Gigantochloa verticillata*) which has been propagated from a plant brought back in a wardian case from Buitenzorg, Java, in 1925. It is from beginnings like this that great plant industries sometimes start. All who had a part in the first propagation of such a new plant share in its romance, once it succeeds.

Where the species came from which are now cultivated in Java is a question. Whether there are any species on the great continent of Asia which are better than the Javanese, is another. Certainly none of those which we have introduced, such as *Bambusa tulda, B. balcoa, B. arundinacea, B. vulgaris, Dendrocalamus strictus,* or even *Dendrocalamus giganteus* appears to me to be as useful a species of bamboo as the several species of *Gigantochloa* I have just mentioned.

As for the Chinese and the Japanese timber bamboos, they belong in a totally different category. They are not clump bamboos but forest-forming species. If you should plant a clump of the Java bamboos I have mentioned, thirty years later you would have the same clump, only it would have grown into a large one twenty feet across, but if you had planted a Japanese timber bamboo, it would in thirty years have spread and produced an acre of forest. I found the Japanese timber bamboos in Java, but they were confined largely to the high altitudes where the climate is continually cool. On the Djeng Plateau the small, hardy species *Phyllostachys aurea,* is used extensively as a hedge.

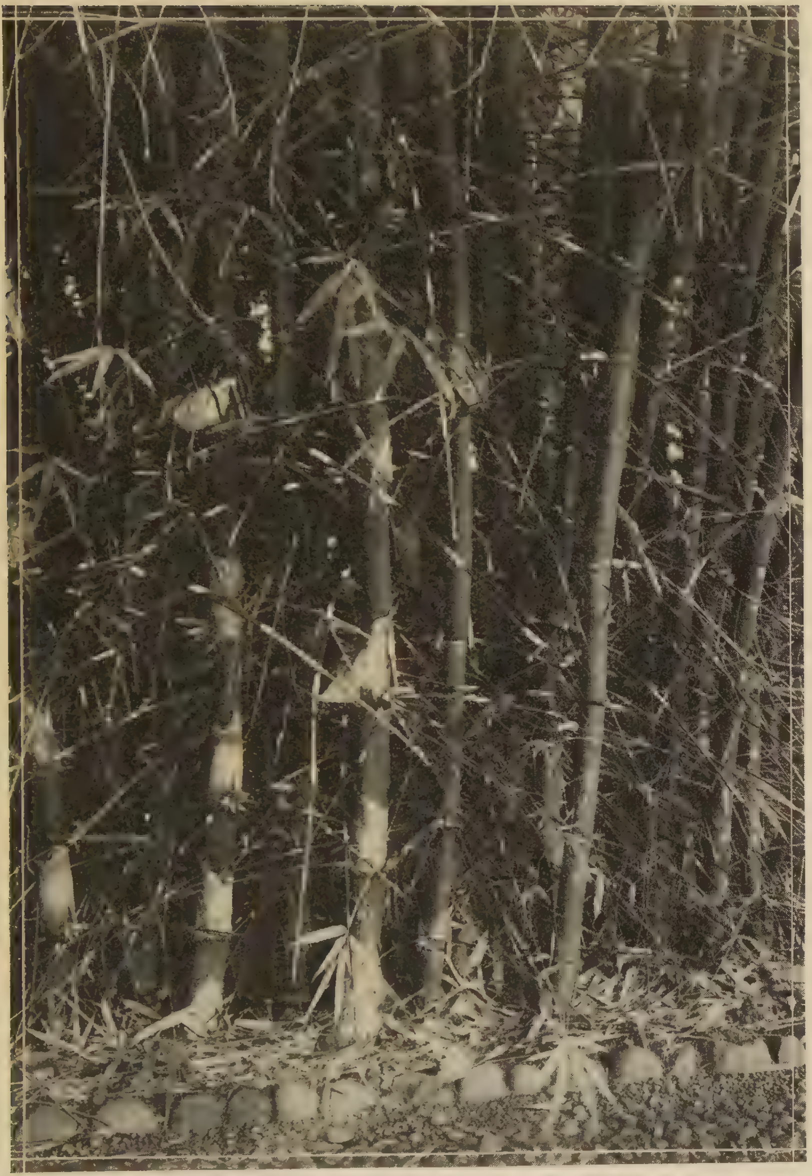
One morning with Mrs. Fairchild at the wheel, Jim and Howard Dorsett set out with a battery of cameras to take moving pictures of wayside scenes to illustrate the dependence of the natives on their bamboo. It was not necessary to leave the highways, for the life of the millions in Java, like that of the Chinese, is much of it on the roadside. They exposed a whole reel or more, filling it with nothing but bamboo. When it is exhibited I hope the audiences will get a faint glimmering of the rôle the bamboo plays in the life of the Javanese.

One of the things I treasure most is a bamboo flute that I brought home with me after my first stay in Java, and whenever a longing to go back to that idyllic island used to come over me I would take out my little flute and play its wistful notes. One hears the flute-playing in Java mostly in the evening, but one drowsy afternoon as we were watching a festival at a near-by temple, to my delight I heard the soft liquid notes of a Java flute, coming from the side of the road. The performer was the

The tali bamboo of Java (*Gigantochloa verticillata*) is so called because its thin strips, or tali, are the universal tying material of the Javanese.

blind flute player of Batoe Toelis. It is hard to describe the character of the notes which came from that simple piece of bamboo. There was something melancholy and sad about them and yet something strangely sweet. They did not make a tune, but seemed to be improvised, as much of the Javanese music is. The player's wife sat beside him and the passing pilgrims dropped their coins in his straw hat. Altogether he made one of the quite unforgettable pictures we took away from Java.

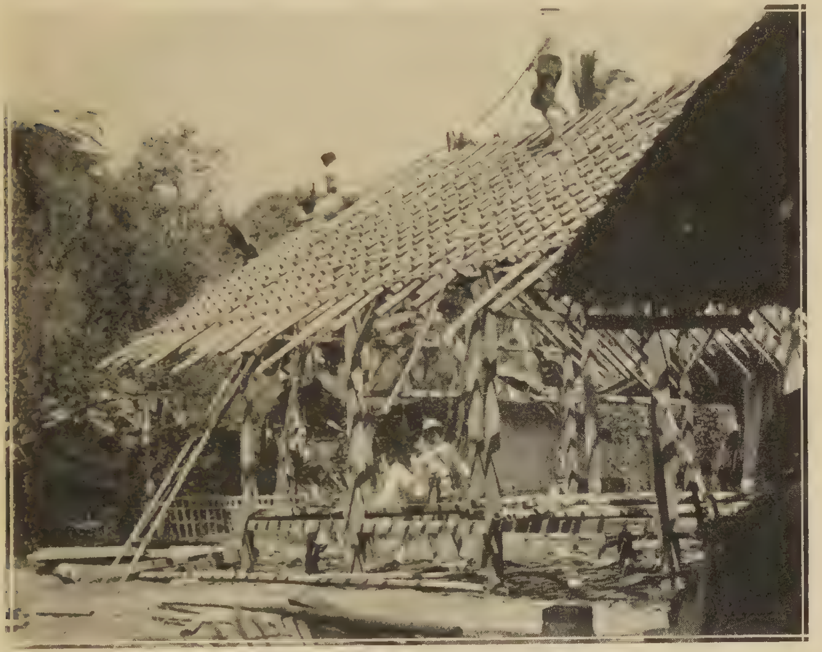
I was keen to revive my memory of the interesting bamboo operations of Javanese carpenters and one day we went looking for houses under construction. We soon found in the suburbs a respectable house of considerable size belonging to a well-to-do Javanese who was able to have a tile roof instead of one thatched with nipa palm leaflets. The rafters supporting the roof were small bamboo stems. The corner posts and the sills and the plates were of hewn timber but all the rest of the "lumber" used was bamboo. Two bamboo mats or "billiks" made on the spot, put up with an air space between, covered the four sides of the house, making walls that keep out the weather even in this extremely rainy region, the windows and doors being cut through the mats after they are put in place. One can see these billiks being carried through the streets everywhere, the carrier completely hidden by them, and when one considers that he is actually carrying over him the whole side of a house, he becomes more than amusing. We watched two men weaving the billik in the dooryard of the house, and it was fascinating to see them raise the strips, always in threes, which formed the warp, and with their bare feet arrange the strips, also in threes, which formed the woof. They had taken the measurement of the wall and had cut their bamboo strips to the proper length. The billik has always fascinated me, so when I found that Mrs. Fairchild was as delighted with it as I, we decided to import a bale of it into Florida, where it has been incorporated very successfully into a house we have built there.



A Burmese bamboo in Java (*Bambusa tulda*) showing the objectionable spiny side branches characteristic of so many species, but absent from the best cultivated forms in Java.

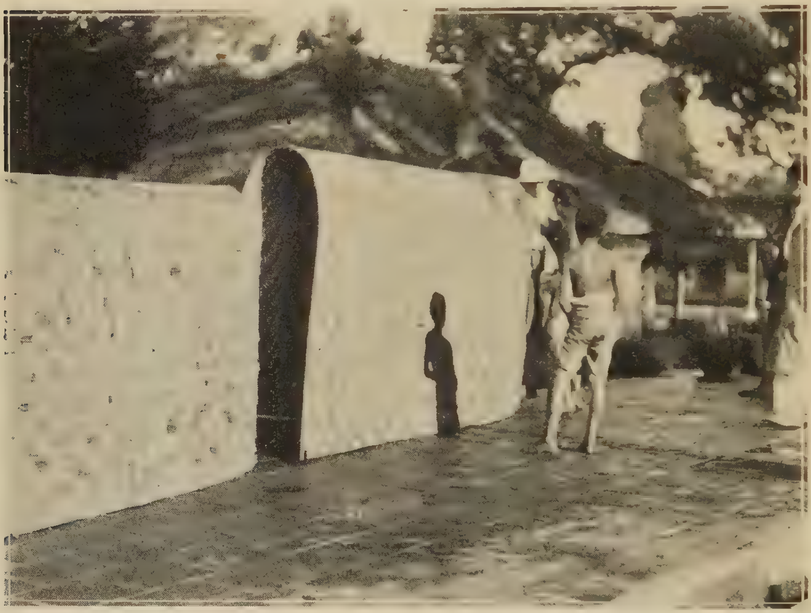
The blind bamboo flute player of Batoe Toelis, whose plaintive music still rings in my ears.

In Java the floor joists are of large bamboos crossed with smaller ones and for floorboards the spread-out hollow stems of the bamboo betong are employed. To see the skill with which the Javanese carpenters spread out a bamboo stem into a board is enough to give anyone a great deal of respect for them. Two work together at the job, one at each end. With heavy, short knives they crack the joints nearest them in a dozen places at regular intervals, turning the stem over as they do so. Then they crack the second joints and the third and so on, each time getting nearer the middle of the stem and nearer each other. When all of the joints have been cracked, each carpenter retreats to his end, and with a sharp stroke splits the top side of the stem clear



The roofs of native houses in Java are made entirely of bamboo poles and strips, on which either tiles or thatch are fastened.

through and then it is but the work of a moment to throw open the whole stem so that it lies before them flat on the ground. The three-cornered broken fragments of the partitions at each point, which were cracked in the first operation, are shaved off and the transformation from a cylindrical stem to a flat board made of narrow strips held together by splinters or fibers, is completed.

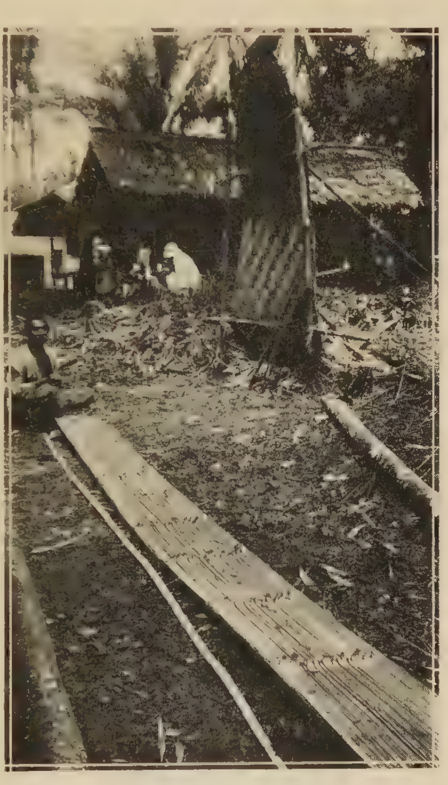


Large mats of woven bamboo "billik" being carried through the streets to the place where they are to form the sides of a house. They constitute a remarkable building material.

The floors of millions of houses in Java are made of these bamboo boards, the smooth polished surface becoming brown with age but never ceasing to have a certain attractiveness about it. Easily cleaned, elastic, and soft to the touch, it is an ideal flooring for a people who go barefooted in their houses and who sleep on the floor as do so many of the Oriental races.

Unless one has tried to use bamboo one does not realize how many tricks the bamboo carpenter has. The material splits so readily that he could not safely drive a nail in it even if he had one, so he ties his framework together. I once saw in Middle Java a theater in process of construction. It was to hold 900 spectators and the floor on which they were to sit was to be four feet above the ground. Not a single nail was in evidence and I do not believe one was used in the structure. Strips of the bamboo tali used as twine, took the place of nails and it was interesting to see the ways in which the larger bamboo "beams" were framed together by the use of short bracket pieces of bamboo tied with strips of the tali bamboo, so named because of the strength of its fibers and their fitness for tying material.

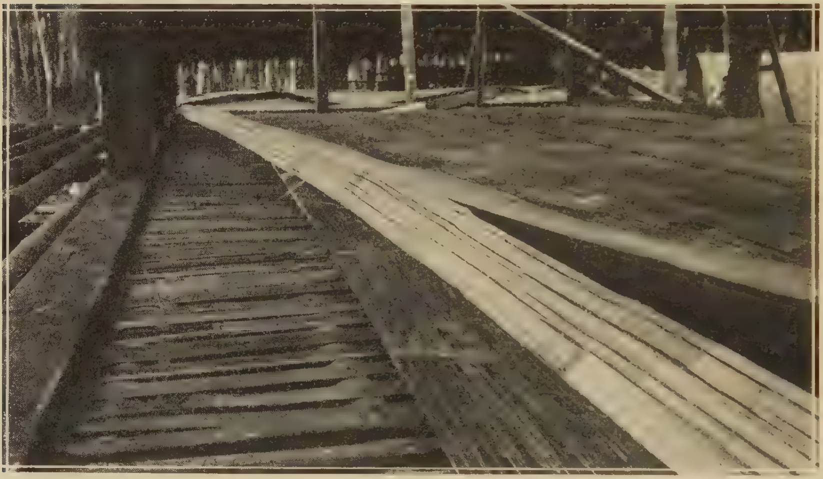
The charming handmade buildings seem to blend so completely with their backgrounds that you are hardly aware, as you tour through the country, that there are any houses to be seen on the landscape; to mar the landscape, I had almost said. Even the roofs, thatched, or of brown tile, are half hidden by the plumes of the bamboos or the overhanging branches of some fruit tree which stands in the yard.



The technique of splitting a hollow stem of bamboo so that it will spread out and make a board is something few American carpenters yet understand.

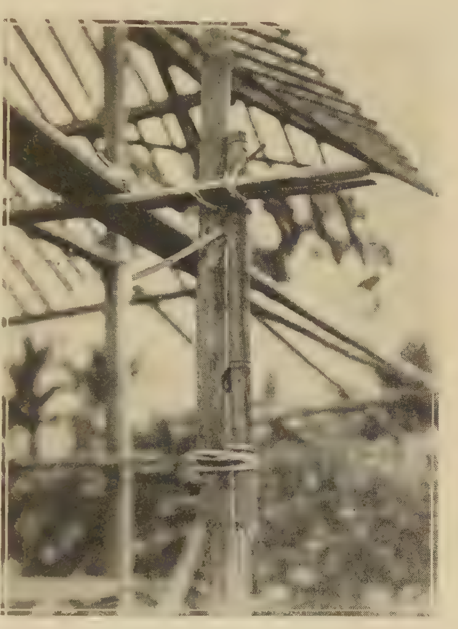
I never tired of wandering in the Javanese kampongs and watching the lives of the people; the dooryards swept clean every day, the bamboo fences separating each household, the bird cage with its cooing doves hung high above one's head, the old people winnowing rice or weaving baskets or making batik or grinding cayenne pepper pods in stone mortars or simply sitting in the cool shade or sleeping, and everywhere little naked children playing.

There are millions of little children in Java. The Javanese and Sundanese and Malay races, which together make up the bulk of the people, are very prolific, and there seems to be no relation between density of population and productivity. If you were to crowd the French people into one-fourth of the area of France you would have no more people to the square mile than there are in Java. Yet the population of Java keeps on growing!



On joists of bamboo the "bamboo boards" are laid and the floors have an elasticity which is delightful to bare feet.

I think the Javanese are a peculiarly happy people. They grow up with few luxuries but their wants are few. As children they lead as natural and carefree lives as any children I have ever observed. There is not to be found in all Java an environment which in any way compares in dreariness with the ghastly slums of such cities as Marseilles or Liverpool or our own Jersey City. The poorest little mite in a Javanese kampong plays happily with the sticks and leaves and bamboo stems and insects and birds surrounding him. There seems also to be always something for the little children to do and they learn to work early. I think the Javenese like to work as much as most people do. The little boys fly their kites and fight pet crickets, which they keep in bamboo cages, and the little girls have dolls. Their theatrical performances, before the movie came, used mostly to portray the acts of gods and demons and courtiers and queens.



Strips of "bamboo tali" are used to tie the bamboo beams together, and they last for years.

I think they are essentially a contented people, and I cannot read anything sinister into the occasional outbreaks of the mixed-breed laborers of the cities, incited perhaps by the Madurese, to which race the chauffeur class belongs. They are not, particularly the Javanese, a fighting people, and with their instinct for agricultural work they represent to-day one of the greatest sources of hand labor in the tropics. It is true that the average yearly income of the masses is fantastically low, only 45 guilders or $18.00, while even the wage which they get in the Dutch-managed sugar-cane fields and the coconut plantations is about the lowest in the world, only ten to fourteen cents a day, but then, the cost of living is proportionately low.

Of the thirty-five millions, only one million live in the cities, the rest of them being in the villages, or kampongs, scattered all over the country. If our American population lived on the land as the Javanese do and in the same proportion, the total of our city dwellers would be only three millions instead of what it is to-day.

The hobby horse dance of the Javanese youth is more than an amateur performance; it has a deep and mystic significance; it is, in fact, a native classic.

Their family life, like that of most tropical peoples, is hardly comparable with ours, for the male member of the family too often has his offspring scattered to the winds, but if some of the taboos which move the society of European and American races are not found in Java, on the other hand they have some which we do not seem to have. Flirtations in public are considered bad taste in Java and during the whole of our stay in the island we did not see a single petting couple such as one sees now everywhere, even in the halls of learning of America. The psychologists may understand why it is that the taboo against any show of affection between the sexes should have persisted when the taboo against miscellaneous intercourse has become so faint. I believe similar conditions exist in other countries.

In America, where the worship of the labor-saving machine has become almost a fetish, it has become painful to see men and women doing work that machines could do better and more cheaply, but in Java there is no such feeling. The problem which bothers the administrators is to find work for thirty-five millions of agriculturally but not mechanically skilled laborers. This fact came out in a discussion I had one day with Dr. Koch who is in charge of the Plant Breeding work and knows the rice situation in Java as few men know it.

Everywhere in Java, as in Japan, one sees in the rice planting season, hundreds of men and women wading up to their knees in the mud of the "sawas" as the rice fields are called. They bend over and plant their rice seedlings with more care, very often, than a lady uses in planting her bulbs. The small rice plants have been grown in a special seed bed in one corner of the field.

I had seen this practice for years and always supposed that the yield from these hand-planted rice fields must be greater than the yields would be from the same fields were the rice seeds sown with one of our American rice planters. Dr. Koch showed me experimental rice fields lying side by side, one planted by hand, the other by machine, and the machine-planted rice had as heavy a yield as the other. The saving appears to be not in the yield, but in the gain of fifteen days or so which the Javanese farmer makes by using his land for a previous crop. He plants the little bed of rice from which he gets the seedlings, in one corner of his bean fields before he has harvested the beans. I remarked on the tremendous expenditure of labor and the grilling exposure to the tropical sun which the farmer made for this slight advantage, and discovered that had he any other employment he could not afford to do this seedling planting. In other words, if the rice were grown by machinery as it is in the Sacramento Valley of California where one man's labor produces more than would forty Javanese farmers, there would be released, let us say, twenty million laborers who would have nothing to do, and they would create a problem in employment that would tax the genius of a Henry Ford.

We visited the various plant investigation laboratories, museums, herbaria, and experimental fields where we were shown every courtesy by the men in charge. After arranging for the wardian cases of bamboos and other plants which we wanted to take along with us, and for a collection of valuable cover crop seed from Mr. Keuckenius' remarkable experimental plots (a collection which is now luckily growing in Florida), we set out to cross Java.

Graham chose to remain in Buitenzorg. Dr. Dammerman had very kindly placed at his disposal a table in the Treub Laboratorium, and the lure of the strange insects and a chance to study them carefully appealed to him particularly, after so many months of travel.

CHAPTER XXXI

INTO MIDDLE JAVA

We had been met at the boat by Patrick Putnam, just out of Harvard, who was in Java on his way to New Guinea, where he was going to collect for the Peabody Museum. He had been working hard on the Malay language and was arranging to go to Papua with a Dutch official who spoke no English but who spoke Malay with great fluency. As he was not to sail for several weeks, he joined us for the trip across Java.

Up over the Pontjak is an exciting drive, for the gradient is thirty per cent on this pass, and the hind wheels slip. Just as we rolled down the other side a great commotion in the valley below attracted our attention and we saw that crowds of natives were running around and yelling frantically about something. Suddenly some of them reached the road and I could inquire and found that they were chasing a wild boar and that the beast was coming our way. Before we had time to see if we were in its path the boar shot across the road, followed by a motley crowd with sticks and spears and a single 22-bore rifle which its owner cracked after the poor animal to no effect as it disappeared in the bushes.

Off the Pontjak pass on the slope of the Volcano Gedeh there lies the Mountain Garden or "Berg Tuin" of Tjibodas, where I once spent a month with a microscope, studying the parasitic fungi occurring in the strange vegetation of that fascinating place. It was all so tied up with old memories and I heard that there had been so many "improvements" made that I preferred to keep my remembrance of it as it had been in the time of Treub, its originator, and so we passed it by.

We traveled through the Preanger Regentskap which is not so rainy a section of Java as that around Buitenzorg, where more than twice as much rain falls as in Washington—fourteen feet a year, in fact. The relative humidity was less, a fact that one notices instantly after even a short sojourn in the rainy regions of the tropics. In Buitenzorg the humidity every morning is around 98 or 99 per cent of saturation. Dr. Koch told me that one morning for some unaccountable reason it dropped to 27 per cent for a few hours and the change in spirits of everybody was amazing. In temperate regions we probably feel changes of temperature more than we realize, but where our systems are accustomed to yearly changes of 100 degrees we do not notice slight fluctuations as they do in such a place as Buitenzorg where the extreme range is only 31 degrees. Anything that breaks the almost deadly monotony of temperature and humidity there is very noticeable. When you stop to think that in Washington the landscape changes from the white snows of winter through the bursting buds of spring, the brilliant greens of summer and the golden tints of autumn, while in Buitenzorg the hills and valleys are always of the same deep dark green shade, the birds always sing at daybreak, the afternoons are always warm, and the middle of the day always hot, it begins to come over you that changes in climate must have a very stimulating influence and that the spirit of enterprise must flag from the lack of change after a long stay under the palms. Those who have to spend their lives in Java tell me that they feel a craving for mountain air that is almost like the craving of hunger.

Bandoeng is one of the high, dry places of Java and for this reason has become the residence of those who have given up all thought of retiring to Holland. It has only half the rainfall of Buitenzorg and a range of 41 degrees in temperature. It has fine hotels and is a center for tourists.

We came in late, so late that it was convenient to have our dinners served on our verandahs and to my delight there appeared on the table what I had looked in vain for in Buitenzorg, a djerook

The pink-fleshed pomelos of Java are very beautiful to look at and amusing to tear to pieces, and, although not juicy, they are most refreshing to eat.

bali, a pink shaddock. The grapefruit growers of Florida are not unfamiliar with the so-called pink grapefruits, but the color of these is pale in comparison with the deep pink of this shaddock, and while it is not very juicy and could never be a rival of the grapefruit (which is probably a variety that arose in the Western Hemisphere), we felt that it might have a place of its own, especially for use in fruit salads. Through the help of Dr. Ochse, the fruit specialist of the Dutch Government, we were able to send three varieties of these pink-fleshed shaddocks to America, where they are now growing. We found the djerook bali was grown commonly in the gardens about Bandoeng, but nowhere did it seem to be budded, from which I judge that the variety comes true to seed.

The following day as we were leaving Tegal, a small town on the North Coast, we experienced one of those quite characteristic shocks of travel, the appearance of a disease. Pat developed a distinct rash, and for a time we were faced with the alternative of hunting a hospital for him in a very unpromising looking place, or taking our chances with him on the road. We moved on to Tjilatjap across on the South side of the island, for it was there that Madame Becker lived and it was she who had the rafflesias growing not far from her house on the adjoining island of Noesakumbangan. At Tjilatjap we were lucky enough to find a remarkably well-equipped hospital with a trained Dutch physician in charge, and Pat's fears were soon dispelled. Several times we had occasion to consult doctors in Sumatra and Java and we were always able to find Dutch physicians who had had not only good laboratory and hospital training, but special tropical experience as well.

I had read and heard of the rafflesia, but I had never seen one in the flesh, so to speak, and now we were nearing the home of this remarkable flower. A ring on the telephone brought an invitation to the Penal Settlement of Java, which is located on the little island of Noesakumbangan, with the offer of a launch to take us over.

The Beckers were delighted to see us and gave us one of the most interesting days of our whole trip through Java. Madame Becker was at one time a botanical assistant in Dr. Janse's laboratory in Leyden and she published a piece of thorough work on the anatomy of tropical lianas. She needed more material for the work and was sent some years ago by Dr. Janse to the island of Noesakumbangan with a letter to the resident of Tjilatjap, asking that she be allowed to collect alcoholic material of the rare forms there. Mr. Becker was the Superintendent of the Penal Settlement, a confirmed bachelor, and he looked with considerable indifference upon the proposal from the Resident that he assist the young lady to collect the "creepers" which overran the forest trees in his plantations. The hunt for the lianas ended in a wedding, from which event the Laboratory in Leyden has never recovered, for there are a lot of empty jars and bottles still on the spotless shelves which would have been filled with "Liana Material," had it not occurred.

One of the ways of the jungle traveler is to cut a segment from some giant liana and drink the sap that pours from its lower end. Mr. Becker showing his guests the trick.

From the porch of the charming house we could see the whole backbone of Java across the strait which separates the island from the mainland. Eight volcanoes raise their heads on clear days, they say. The rafflesias were waiting for us in the forest back of the house and for fear of a rain we hurried at once through the jungle trail to look at them. As we passed out of the back door I saw a goat in the yard. "Oh, yes," said Mrs. Becker, "we did have two, but a few nights ago a tiger came and took one. It broke my youngest's heart and Mr. Becker is going to lay for the tiger to-night and see if he can't kill it." Tigers in Java prowl about the houses at night much as the foxes or the polecats do around American homes, picking up any stray domesticated animal that happens to be unprotected.

A Dyak prisoner with pierced ear lobes that looked more like German pretzels than anything else, led the way along a trail he had cut to the base of a tall forest tree from which a tropical grapevine was hanging. He had cleared the spot of undergrowth and we saw scattered over the brown leaf mold what looked like round pink puff balls, the size varying from that of a big turnip down to that of a large marble. A closer look showed that the larger of these brownish pink things were composed of leaves like heads of cabbage or the buttons of Brussels sprouts. They were more like mushrooms than flowering plants. The knobs were scattered along the line of the grapevine roots and attached to them, and seemed like outgrowths of the roots themselves, at least the smaller ones did. They are true parasitic plants, like the mistletoe, needing no leaves nor stem, nor roots, only a sucking organ with which to divert the sap of the grapevine into their own structure. We cut some of them open and inside found the floral parts as described with so much care in the books of botany, for the rafflesia is as well known to botanists as is the sequoia. Unfortunately not one of the rafflesia flowers was open. These were only buds and we had to make another expedition to a different part of the island to see the flowers in bloom.

We went a half-hour's trip by launch, then another half-hour by pony and sedan chair, then ten minutes on foot, all in a fine tropical drizzle, and escorted by ten or fifteen criminals, most of them up for murder. And even then we did not see a flower in its prime, with delicate pink color and fresh bloom. What we saw was an almost black flower-shaped thing flat on the ground, as large as a wastepaper basket, with five leathery-looking flaps for petals and a cavity filled with spine-like projections. From this center swarmed a cloud of small flies, and as I stooped to look at it, I detected the carrion stench characteristic of it in this late stage of its development. The flower measured sixteen inches across, only about half the size of its Sumatra relative, *Rafflesia Arnoldiana,* which is thirty-six inches in diameter. Why the largest single flower in the plant kingdom should be a thing with so little charm will be hard for those who want to know the "why" of things to explain, but that its complete parasitism should have led to an atrophy of every other but its reproductive parts is in harmony with all we know of living things; organs atrophy with disuse, whether the source of nourishment of the parasite be another living body or a society of living things like a colony of ants or a society of human beings. The parasitic life leads to the atrophy of the unused faculties.

We were in the midst of the dense rain forest in a penal settlement off the coast of Java. From all over the archipelago criminals are sent to Noesakumbangan, and the Dyak with the pretzel ears was a head hunter who had failed to get as many heads as his sweetheart demanded before she would marry him, because the Government stopped him and sent him here after his last murder, when he had only five instead of the six skulls he needed to win the lady. While it would seem to be a simple matter for these prisoners to overpower their guards and escape, they seldom make the attempt and Mrs. Becker lives there with her husband and family in perfect security, in fact she is one of the few Dutch women we met who really loved the tropical life.

In the launch we made a trip to a fishing village built on piles in the shallow water of a bay, nearly a mile from the nearest shore. It gave us, I think, the best conception one can get of the prehistoric lake villages of Switzerland, and a very clear understanding of the protection such a situation would give from attack and from fire, those two most evident dangers which threaten the existence of primitive man.

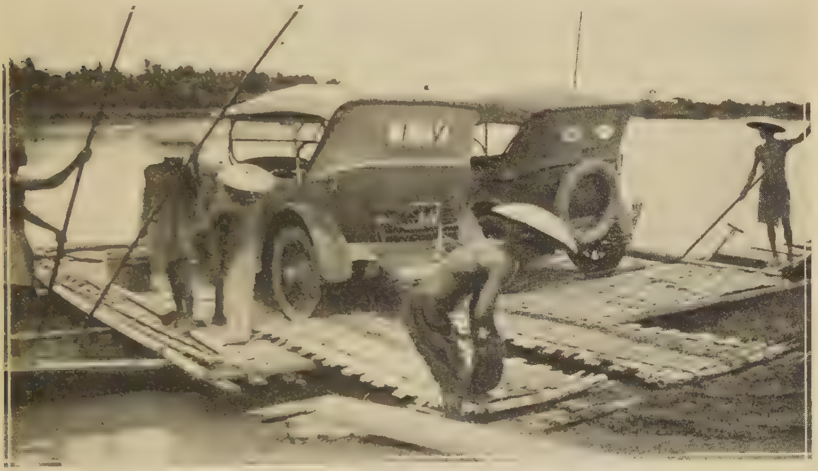
It was by this time the middle of April, spring was opening in Manchuria, and Howard Dorsett and Jim had their passages on a Japanese liner for Hong Kong, so we saw them on board the train and waved them good-by as they stood on the back platform of the little train that pulled out of Tjilatjap the next morning at daybreak. They were both in perfect health and I little thought then that the next time I was to see Jim he would be on his deathbed in Washington, where he died of tuberculosis eighteen months later. His enthusiasm and knowledge of photography, his eagerness and willingness, his breezy way of talking and the slang which often puzzled Brandt Buys who was not familiar with American English, but above all else his winning smile had won the affection of every person who met him.

I wanted to visit the noted bamboo region of Kedoe and get up onto the Djeng Plateau, and as Pat Putnam was keen to see the same regions we pulled out early from Tjilatjap for Wonosobo. It seemed almost like a spring morning. The sunlight streamed through the enormous canarium trees as we drove down the straight avenues, mile after mile of them, until we had traveled seven miles. Tjilatjap is not a large town, but in the days of sailing ships it was an important one, and one of its Residents with large ideas about city planning and planting had laid out a checkerboard of squares one kilometre in size and planted all the streets with magnificent canarium trees, than which there are few more beautiful avenue trees known. Nowhere in my travels have I seen such romantic avenues. The noted canarium avenue of the Botanic Gardens in Buitenzorg, beautiful as it is, cannot be compared with the avenues of Tjilatjap.

Crossing to Maos one has to take a ferry, the most completely bamboo ferry imaginable. It consists of several layers of strong bamboo matting laid over two long dugouts, but it will hold two cars and the operators pole it skillfully across the stream.

We were now in Middle Java, and the people on the roadsides were mostly pure Javanese, quiet, reserved, even timid, but not, as they were thirty years ago, so unaccustomed to seeing white men that they dropped on their haunches and took off their hats out of respect. The beautiful dwarf nipa palms filled the borders of the mangrove swamps and made me more anxious than ever to see them on the low marl prairies of South Florida.

Soon the sugar-cane fields began to appear, brilliant with their silvery white plumes of flowers, "arrows" they are called, reminding me that it was in Java that some of the very earliest work was done which resulted in the production of sugar-cane varieties with nearly double the amount of sugar in them that the old sorts had. From earliest times sugar-cane seems always to have been grown from short lengths of the stems, instead of from seeds, and never did it occur to anyone of the millions who must have worked their lives away in the sugar-cane fields of the world, to try to grow a cane from seed, until simultaneously and independently, in 1887, an English chemist in Jamaica and a Dutch botanist in the moun-

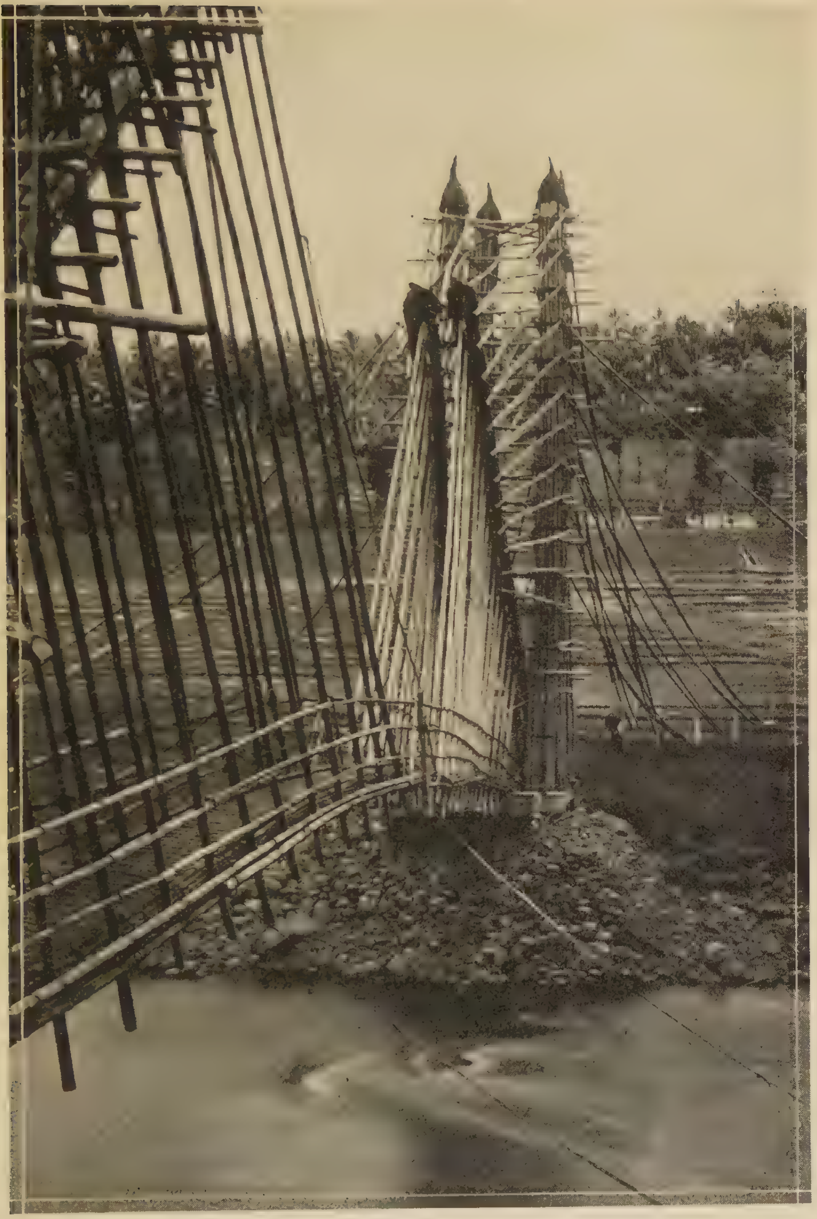


Crossing the River Maos on two Javenese canoes floored with bamboo mats.

tains of Java made the experiment. Harrison of Jamaica once told me that his attention had been first attracted to some strange grass-like plants he noticed growing in the cane fields. Every one assured him that they were grass, but one day the idea occurred to him that they might possibly be sugar-cane seedlings, and he started in at once to find out; while Saltwedel in Java close-pollinated the flowers of two wild canes, the *glagah* (*Saccarum spontaneum*) and the *glonggong* (*Saccarum saltwedeli*), just to see what he would get when he planted the seeds.

Many tons of boulders encased in bamboo basketry prevent the mountain torrents from washing away the fields.

To-day there is in the east of Java, a proefstation which is spending a million and a half guilders a year in the study of sugar-cane. One of its numbered varieties obtained by crossing and selection is known as P. O. J. 2878 (Proefstation Ost Java) and is a descendant of the *glagah* with which Saltwedel worked in 1887. Because of its high resistance to the sereh and mosaic diseases which are among the greatest obstacles to sugar-cane culture in Louisiana,



The famous bamboo bridge of Bandjar Negara in Central Java. It is a suspension bridge built entirely of bamboo with the exception of four large corner posts.

this and other canes of the same inheritance are being widely propagated and tried in the flooded areas on either side of the Mississippi river.

We soon came into a region where the mountain torrents were evidently difficult to control, for along the banks we saw ingeniously made bamboo baskets filled with rocks put there by the Javanese to check erosion. Some of these baskets were thirty feet long and they were intertwined for many rods along the banks in such a way that it must be a very strong current indeed which could move them. It is conceivable that a similar use of the bamboo on the dikes of the Mississippi may come some day when the groves of bamboo we have already started in Louisiana shall have become so many and so large that they can supply the bamboo strips out of which to make the baskets.

At the kampong of Bandjar Negara, before we reached Wonosobo, we passed a most wonderful bamboo suspension bridge looking like a gigantic cobweb stretched across the mountain torrent. It showed clearly the extent as well as the limitations of the bamboo material. For all pulling strains the bamboo is, weight for weight, as strong as steel, but for rigidity, even the largest of the hollow stems are not stiff enough for so large a structure, and in this amazing bridge I noticed that the corner posts were of heavy timber. There is a curious grace about the sweep of the bamboo cables and one feels quite secure as one walks across its bamboo matting floor. Not a screw or a nail is to be seen in it, and although there were signs of age in the bamboo tying materials, making you wonder whether some day the whole thing might not go down all at once, the decay was nothing as compared to the rusting which goes on unnoticed in a steel bridge unless it is kept carefully painted.

Wonosobo, at the foot of the Djeng Plateau, is one of those idyllic spots for which Java is famous, and its bazaars have not been ruined by too many visitors. It is the center of a great bamboo-growing area, so we spent several days studying these plants, as well as cleaning the seeds we had accumulated since our last stop, and packing them for the post.

At the same time we made arrangements for a trip up onto the Djeng Plateau, ponies for Pat and me, and a sedan chair for Mrs. Fairchild, who had become quite addicted to that method of travel.

Junghuhn, the naturalist, who in 1845 traveled as an explorer all over Java, remarks that the forests on this Djeng Plateau[1] had been destroyed. Had I not seen this book I should have thought that this destruction and the occurrence there of so few species of indigenous plants was something of recent origin.

The Djeng Plateau is a restricted area compared with that of the Bovenland of Sumatra but it stands higher, being at an elevation of between six and seven thousand feet, and in the cool dry season ice sometimes forms three quarters of an inch in thickness. It is inhabited by rather unattractive mountain folk who seem to be always huddling about smoky fires inside of dingy bamboo huts. They give the impression of great poverty, and suffer much from colds, which are affections one seldom finds in the lowlands. In fact, like Newara Eliya in Ceylon, it seemed to me to be too high, and the fog and cold were very trying. It is difficult, coming up from the lower altitudes, not to underestimate the dangers from the colds which prevail in the mountains, as I found to my own disgust, for I caught a cold on the Djeng that interfered seriously with the remainder of my stay in Java.

The Plateau is filled with signs of volcanic activity and we found ourselves puzzled the following morning as we stood before what looked like an extinct crater densely filled with ferns and flowering plants, because it bore the title of the *Dodendaal*, Death Valley.

The guide tried to explain that there were gases rising from the bottom of this Dodendaal or Death's Valley which made it dangerous to enter and that the grave of a venturesome individual by the name of Keller, which we had just passed, attested to that fact, for he had lost his life in the Dodendaal. Both Pat and I were for getting a sniff of this so dangerous gas for we imagined it to be nothing more than carbon dioxide, but Mrs. Fairchild objected, and in the discussion proposed that she sacrifice herself and let the scientists live. We were for letting her try the valley of death for we felt sure the gas would only overcome one slowly and that she could go quickly in and come out again without the slightest danger. But she changed her mind and did not go, and later we found that it really was a dangerous thing to visit the Dodendaal and that we had had a narrow escape. However I think that both Pat and I should still like to test it out.

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[1] Junghuhn, Friedrich, "Reisen durch Java," Magdeburg, 1845, p. 382.

The most ancient ruins in Java are on the Djeng Plateau and date from the first Hindu invasion of the island.

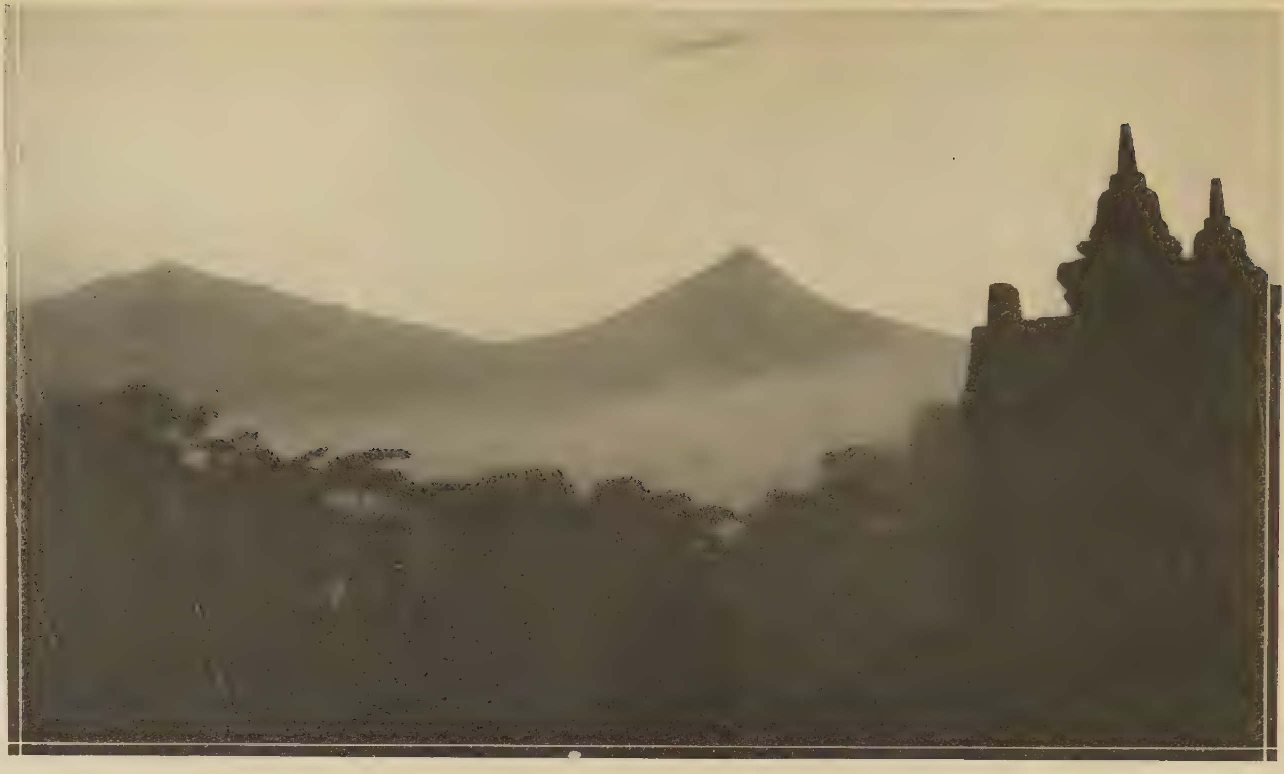
Some ancient ruins, said to be the oldest in all Java, stand in the middle of a swampy area of the Djeng, while the outlines of surrounding walls cover many acres. How they came there, and how long ago they were built, is still a matter of considerable discussion. Whether there was at one time a dense population about them or not, and why they are now in ruins, are questions that may never be answered. I was struck with the resemblance of much of the work on them to some of the Maya architecture, which Drs. Holmes and Morley and others have been studying in Yucatan, and I showed my photographs to Dr. Holmes who, had he been as young in body as he is in spirit, would, I know, have posted off to the Djeng to invesigate. According to such an authority as Pierre Gonnaud, the ruins represent the work of the early converts to Brahmanism, following the first Hindu invasions of Java.

A tiny corn husker of the Djeng Plateau in the mountains of Java where this American food plant was introduced centuries ago.

As I rode about over the hillsides of the Djeng it seemed to me that there were few Javanese species of plants represented. There were corn fields and tobacco fields, both American cultures, and the Australian eucalyptus and acacia trees were everywhere. Japanese bamboos were used for hedges and the whole scene struck me as one produced by introduced species of plants. I see that Junghuhn observed the same thing eighty years ago. How early did these crops get in here, I wonder, and when were the native forests destroyed? Perhaps the forests were destroyed in the eighth century, when possibly the temples were built.

It was interesting to go direct from the Djeng Plateau and its ancient Hindu ruins to the Buddhist Boroboedoer, one of hte greatest ruins in the Orient, and one of the most remarkable in the whole world. We timed our visit so nicely that we saw its terraces first in the golden light of a superb sunset, then watched the full moon rise over it out of the mists, and stood there again at daybreak waiting for the sun to brighten its strange dagobas and bring out its myriads of sculptured figures. The setting of the Boroboedoer is superb, and as the day dawns there loom before you through the mists of the morning three great volcanic cones, each of them not more than twenty miles away, and each about ten thousand feet in height, the Merapi, the Merbaboe and the Soembing, seeming like sentinels, to guard the sacred spot. At sunrise the stone galleries we had wandered through the night before by moonlight, trying to make out the carved figures composing the miles of frieze on either side, came into plain view,

The little children of the mountaineers of the Djeng Plateau learn to work early, and even this tiny tot (probably a dwarf) felt himself too busy to pose for his photograph.



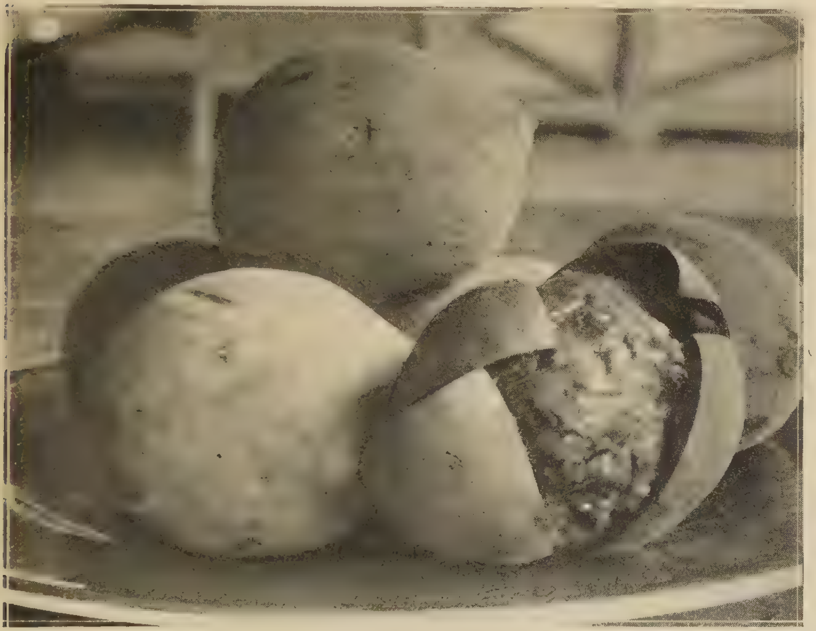
The coming of the dawn over the volcanoes Merapi and Merbaboe as we saw it from among the dagobas of the ruins of the Boroboedoer.

the gray lichen-covered figures representing scenes in the life of Buddha amazing us by their number and variety. Three miles of them are supposed to line the walls of this immense pile which is nearly five hundred feet square, built around and over a small hill where are said to lie some of the ashes of Buddha.

If one looks away from the immense pile of stone, which sometime in the eighth century perhaps, thousands of workmen were busy chiseling, there is no civilization in sight beyond a few bamboo houses and a kampong some distance away. It is almost a deserted plain, with coconut palms, and shade trees and sawas. Was the building of this great temple, a sacrifice demanded by religious conquerors, I wonder? Naturally it is more poetic to imagine that every poor workman who labored on this edifice was stirred with the religious fervor of a Crusader and worked from dawn far into the evening on his task, but after all, even supposing he was forced to work, the fact remains that what he created has lived long centuries after his bones have turned to dust. The hardship of the moment's task often makes man forget that in what he accomplishes may lie a kind of immortality that he is overlooking as he dreams of another and a quieter world. This gigantic temple on the deserted plain has seemed to me to represent the immortality of ten thousand, perhaps of a hundred thousand souls, an immortality that I at least, could see and feel, as I ran my hand over the superb curves of the statuette of the Buddha beside me.

We had seen, on our way from Wonosobo, some groves of the tali bamboo which were brown and looked diseased, and which upon examination appeared to be attacked by some species of borer. Snugly tucked away in one or more of its lower joints each cane had the sawdust nest of a larva, around which decay had started, affecting the whole stalk so that the plume of delicate leaves had withered and turned brown and the cane had died. There were hundreds of these dead bamboos in the grove but although I looked for an hour or more, I could not find a living larva. They must have gone into the ground to pupate. These were the only evidently diseased canes of bamboo which I observed in the whole of Java, usually these plants were peculiarly free from scales or other diseases wherever I studied them.

After photographing my diseased canes and making a visit to the market of a kampong near by we took a last look at the Boroboedoer and left the sacred spot feeling that never again would it be possible to see it in so romantic a way, by sunset, moonrise, by full moonlight and by sunrise. It had made an indelible impression on our lives, as it must have on millions of others through the centuries.



The fruit of the keppel is a favorite with the ladies of the Sultan's harem.

As we drove rapidly along toward Djokjakarta, I saw a handsome tree beside the road in a private yard. It was covered with delicate deep pink and lighter pink leaves, making a most striking sight. In some excitement I jumped out and entered the dooryard to see it. The owner came out and in answer to my inquiry told me that it was a keppel tree and began hunting through the tree to find a fruit for me. He succeeded and placed in my hand a russet brown fruit the size of an apple whose relationship I could not even guess, though there was a faint suspicion in my mind that somewhere I had heard the name before.

At Jokja or "Djokja" as it is perhaps more commonly spelled, we found an up-to-date and comfortable hotel, and what is more, a sympathetic landlord who was interested in everything. At once I took my fruit to him. He knew it and said, "Yes, I have two trees in my yard here. It is the famous keppel tree." Then, looking around to be sure nobody overheard, he whispered something to me which I cannot put in print, but which finished with the words "and it is a great favorite with the ladies of the Sultan's Harem." As there were said to be many keppel trees in the grounds of the ruined Water Palace we went there in search of them. What a strange deserted place it is! On every hand the decayed grandeur of other days when the Sultan of Djokjakarta was not merely Sultan in name but master of Middle Java. This was long after the Europeans had discovered the island. The whole structure of crumbling concrete was made by some Portuguese architect in the 18th century who had evidently been given carte blanche and ordered to make the most luxurious swimming pools and lounging places that a licentious monarch with unlimited wives and concubines could imagine. And scattered through its spacious grounds and near the very entrances to the swimming pools stood the beautiful keppel trees, pink and wine red with their new foliage, but not in fruit. The pools were full of water, over which floating water plants had grown, but in which the glistening bronze forms of little boys were swimming, oblivious of the fact that in other days these pools were filled with ladies, the ladies of the harem.

A handsome keppel tree at the entrance to the old Water Palace at Djokjakarta.

The cold I had caught on the Djeng Plateau began to be serious and kept me in bed for several days, for which, now that it is all over, I think Mrs. Fairchild is very thankful, for it gave her a chance to learn something of the Javanese art and the art of Bali, particularly as expressed in those wonderful batik cloths called "Sarongs," "Kains," "Slandangs," etc. The result was, of course, a collection, and to-day our walls and tables and pillow cushions remind us that there is on the edge of the Java Sea a civilization where soft mangosteen browns and curry-powder yellows and hand-fermented indigo blues still take the place of the analine dyes with which we illuminate our household environment.

While she played with batiks I gathered, through the boys of the hotel, all sorts of fruits from the Djokja markets, among them of course the keppel. I found it to be a relative of the cherimoya, an *Annonaceæ,* with a jaw-breaking pedantic name, *Stelecocarpus burahol,* given it by Carl Ludwig Blume because forsooth it bears its fruits direct from the trunk as the cacao does. The whole family to which this keppel belongs has for years had a peculiar interest for me, and I was naturally delighted to find one I had never heard of before, especially as I think it offers possibilities for South Florida as well as for the tropics of the Western Hemisphere, so I gathered and packed hundreds of seeds. As I write these words I am wondering how large my little keppel tree has grown to be since I left it in my home in South Florida six months ago. In flavor it is perhaps more like its cousin, the so-called pawpaw (*Asimina triloba*), which grows in thickets along the Potomac, than any other of the order, but it is juicier and sweeter, "more refined," though I do not know exactly what that means. It has a delicious aroma, as do all the annonaceæ, and I think one might become extremely fond of it.

I should like to go back to Djokja, spending a month and getting more of the interesting fruits that come on its market with the different seasons, but I know if we once got so far again Mrs.

Village boys playing in the ruins of the Sultan's Water Palace, in the pool where his wives and concubines once bathed.

Fairchild would push on to Bali, a little island east of Java, where the life is more as it used to be in Java thirty years ago, and where there seem to have been born a most surprising number of people with keen senses of proportion and color and appreciation of the dramatic, and where pageants such as are seen nowhere else in the world to-day, have been held for centuries.

When I was able to be about again we went to that other Sultanate of Middle Java, Soerakarta, or Solo as it is familiarly called. We went with a remarkable photographer, Tusillo Adams, who had been invited by the Sultan, or Susuhunan, as he is titled to distinguish him from the Sultan of Djokja, to take moving pictures of the royal Wyang Wong or troop of dancers and musicians. The exhibition took place in the Sultan's Zoölogical Garden and was interrupted by a wild boar, which got away and had to be rescued from the lily pond, and was enlivened by the presence of a tame clouded leopard and a full-grown orang-outan which drank beer as though used to it.

If I thought that there were any chance of Americans turning from the music of the West African darky to the classical gong music of the Javanese I would hang on to my hope in our civilization. At least some such vague thought came into my mind as I sat and listened to the blind leader of the Sultan's gambelang or orchestra, composed of thirty pieces, mostly gongs, while he led his players through the soft love music and the stormy movements of personal combat and the terrific chords played when demons came on the stage, timing each to the slow graceful movements of the dancers who rarely lifted their feet from the lawn, and depended upon their arms rather than their legs to stir the audience. I had lost my heart years before to the Javanese gong makers and here I was listening to past masters in the art of improvising music on gongs ranging in size from that of a teacup to that of a cartwheel.

The carrying power of these gongs is so great that when the one we brought home with us is struck its boom is heard across the Bras d'Or Lake more than a mile away.

There is something that suggests the far-away and long-ago in a Javanese Wyang Wong and it could no more be transported to a music hall and keep this character than could the delicate wind flower give any idea of its beauty in the smoke-laden atmosphere of a cabaret.

In Solo we said good-by to Pat Putnam, who went back to Batavia on receipt of a telegram saying that his Dutch official was ready to sail.

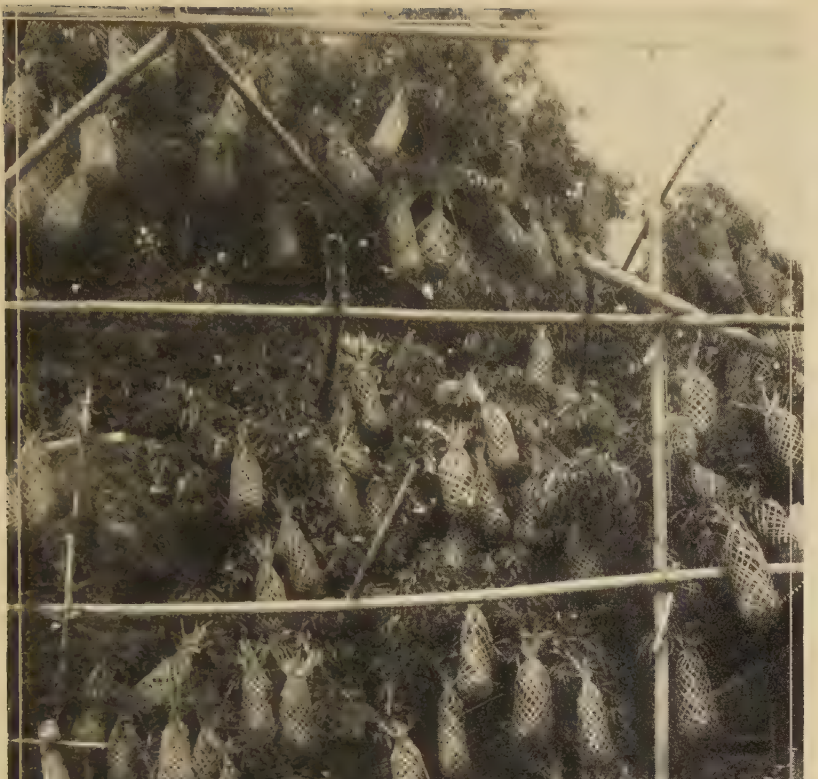
The blind gong player in the Sultan's gambelang.

I was told that the Susuhunan had an interesting garden in his summer "palace" on the slopes of the Lawoe at a place called Karangpandan, and as my health still lagged, we went there for the altitude. It lay over two thousand feet above the sea and from the little verandah of the hotel where we stopped we could see before us the Merapi, the Soembing, and the Oengaran, from eight to eleven thousand feet high, and farther away, but still visible above them, the Merbaboe, while behind smoked the great Lawoe 10,600 feet above us. In sight of five of the great volcanoes of the world and overlooking a tropical landscape of unbelievable charm—this is Karangpandan. Red and white roses were blooming inside the bamboo fences, white gardenia bushes ten feet high were in blossom, great mango trees spread their crowns over the tiled roofs, the Javanese gardener with his tied bundle of palm ribs swept the leaves from the pebbled walks, a nurse maid or baboe watched her little Dutch charge on the steps below, while the rain clouds, in rolls of brilliant white, gathered in the afternoon sun under the peaks of the volcanoes as though some railway train had passed and left a streak of smoke.

We had brought our treasures here to gloat over, sarongs and seeds, but it was easier to sit and watch the gathering thunderstorm and the zigzag row of rain trees outlining the roadway across the valley than it was to gloat, for until one has really enjoyed a downpour in Java one cannot be said to have seen the island at all. The suddenness of it, the complete change in everything, the darkness, and the refreshing breeze, then the steady drum of the rain on the roof, becoming a deafening roar as though the house must be beaten down, is strikingly dramatic. In an hour the sun shines again, then disappears in gorgeous colors behind the mountains and night settles down.

The electric lights on the verandah were very bright, the evening proved a trifle close after the storm, and the insects began to swarm. Such numbers and such forms, I have never seen before or since! The white walls were alive with them, we gathered them in as fast as we could, catching only one or two of a kind. Late into the evening the swarms continued and had Graham been on hand I doubt if he could have left the show before the small hours of the morning. If anyone thinks he is familiar with all the different forms of insect life let him go to Karangpandan and wait for a rain. Perhaps he will be rewarded, as we were, by having walk in upon him a real, an actual walking-stick, a stick that walked.

The Sultan's so-called Summer Palace didn't look as much like



The Sultan of Djokjakarta had ordered each cluster of fruit on his lychee tree to be covered with a woven bamboo basket to keep away the flying foxes.

a palace as we had imagined it would, but there were a number of interesting trees growing in the characteristically neglected gardens around it, among them a large fruited doekoe (*Lansium domesticum*), the largest I had seen, and a single large lychee tree (*Litchi chinensis*), loaded down with fruit, although it appeared instead to be loaded down with bamboo baskets. The fruit bats are as bad in Java as in Ceylon, so the Sultan, who is excessively fond of the lychee, had ordered every cluster covered with one of the expansible baskets in which the fruit sellers everywhere in Java pack for you the fruit you buy. If we could only import a ship load of these baskets to cover our mangos with when they begin to ripen in Florida! The trouble would be that our two-legged fruit thieves would then take basket and all. Both the doekoe and the lychee will before long find their way onto our American tables, where they deserve a place beside the grapefruit and the strawberry.

We saw the keppel again, and in its glory, in the yard of a sugar planter on the slopes of the Lawoe. He also had one of the handsomest ficus trees I ever saw, from which I was able to get a lot of seeds and these are now making fine trees in South Florida. I hope before many years to have the pleasure of walking under one on my own place, though I do not even know its specific name. In the marketplace where I went to see the carts filled with shaddocks, not pink ones however, leaving for Solo, I found a small Waringian ficus tree loaded with its small red fruits and these also I sent in quantity to Washington, for of all the strange avenue trees that I have ever seen, the Waringian is the strangest. Like the banyan, but with much smaller leaves, it spreads over the ground by hanging aerial roots, until a single tree comes to look like a whole grove. Little plants of it are now struggling with the limestone soils of Florida and with the clay soils of Cuba, the Panama Canal Zone, and Honduras.

CHAPTER XXXII

EAST JAVA

So far we had seen almost no mangos at all, and no good ones, for it was not the right time for them, July to September, being their season. The East end with its drier climate, is the place where the mangos of Java are largely grown, and there is an experimental orchard at Pasoeroean which we were anxious to see, so we pushed on through Kediri and Malang to Soerabaya. I was still not very well and it did not seem safe to stop where there were no doctors.

I had been in Soerabaya with Mr. Lathrop in 1899, but there were few places in it that I could recognize, for it has grown to be a city, with a very attractive suburb filled with comfortable bungalows, where the prices of land compare with those about Washington at the same distance from the center. From the looks of the shops and the traffic on the streets and the number of automobiles one would judge that Soerabaya is rapidly coming into its own as the great gateway to the vast Archipelago with its immense islands of Borneo, Celebes, Ceram, New Guinea, Timor and the endless number of smaller islands which compose the Moluccas. The route to Australia through the Torres Straits and past the Great Barrier Reefs goes by Soerabaya and I could feel the meeting of the two civilizations, the Australian from the South and the Dutch from the North, which will in time explore and develop this vast array of tropical islands with its multitude of races and secluded island communities.

It was into that paradise of a thousand islands that we were to have penetrated with the Utowana, but that field of exploration must be left for younger and sturdier men, with wings perhaps.

We made a trip to Pasoeroean and spent the night there, meeting in the Director of the Proefstation and in Dr. C. A. Backer and Mr. E. de Vries some of the most enthusiastic and well-informed men whose acquaintance we had made in the island.

I felt quite at home in the experimental orchard of mangos and was only sorry that Mr. Ochse who is the Fruit Specialist of the island, in general charge of all this work, had been called to West Java so I could not go over the varieties with him. His assistant, however, Mr. de Vries, was a mango enthusiast and had made colored drawings of all the best varieties of mangos in East Java. From these I gather that there are five varieties well worth the consideration of the mango growers of South Florida, the "Golek," "Gadoeng," "Aroe Manis," "Madoe" and "Manalagi" and while none of them are large mangos, nor are any of them of that brilliant scarlet which characterizes the Haden, they are of excellent quality and free from fiber. I was given a collection of these mangos and we tried to get them to America, but most of them died on the way, so we are trying again.

The method of propagation at Pasoeroean is by inarching, and I saw trees fifteen years old with potted seedlings attached to all of their lower branches just as I had seen them in Poona, India, in 1902. I do not understand why this method persists in view of the much more practical methods of budding and grafting the seedlings which have been devised in Florida and Panama. By the inarch method the number of plants that can be propagated is limited to the number of branches available on the mother trees. However it was most interesting to know that collections of the best of the Javanese mangos are being distributed through the country, and I at once offered to send a collection of those we have gathered together in Florida from different parts of the world, as well as the gorgeous red Haden mango, which originated in Florida and whose like, so far as looks go, I have not seen nor heard of anywhere else on earth.

There is a great deal of so-called alkali soil around Pasoeroean and I was especially interested to hear that on this soil mangos are always grown on seedling stocks of the "Kopjor," but that on clay soil with hard pan the "Madoe" is used. To my delight I found that the Saigon mango from Cochin China, a variety I introduced into Florida in 1902, where it has done particularly well, was being grown in Pasoeroean also, and is a very promising variety there in competition with the Javanese sorts.

Dr. Backer, who is the authority on bamboos in Java recounted to me his experiences with the West Java bamboos in East Java and pointed out that the "Bamboo doeri" (*Bambusa bambos,* Backer) is the best for this region because it sheds its leaves when the dry season comes, whereas the other varieties dry up. He dug me some clumps of his bamboo to bring home, but these, with most of the mangos, perished in crossing the Indian Ocean.

I saw a small baobab tree near the roadside and I had seen a single palmyra palm, both of which plants I was later to see in West Africa, and I think their presence is a distinct indication of the drier conditions of East Java as compared with those of West Java.

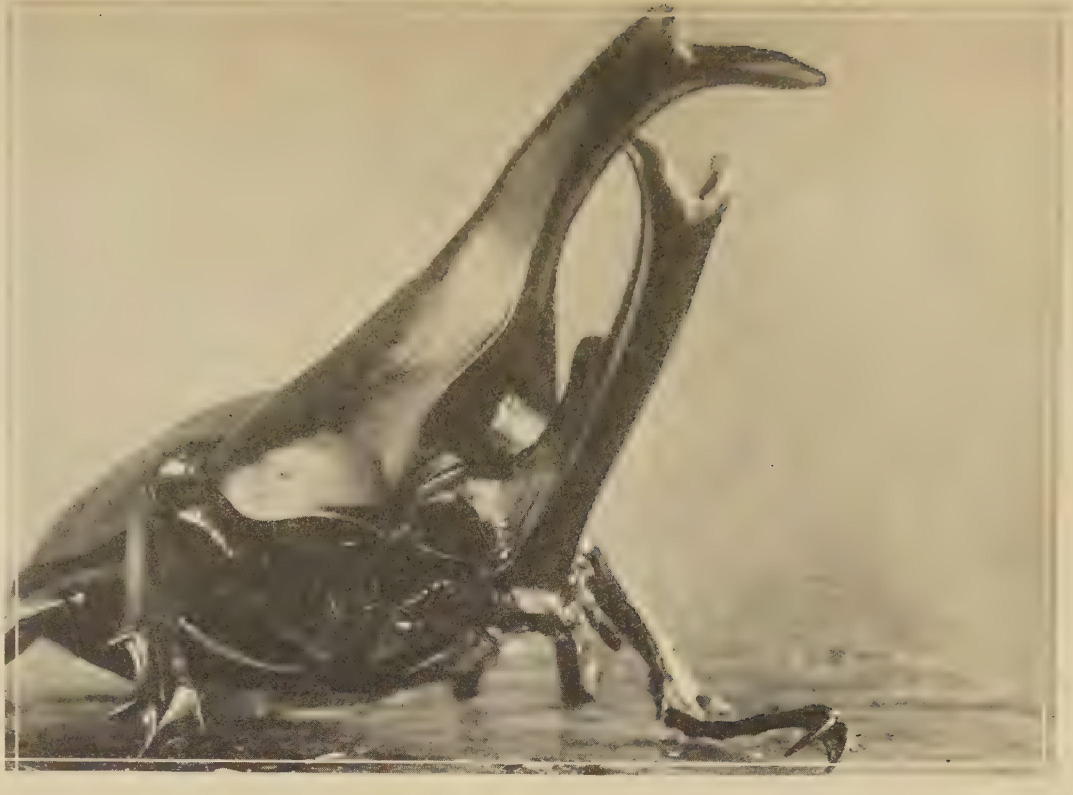
As I have already said, some of the most remarkable work that has been done in the improvement of the sugar cane has been done in the "Proefstation Ost Java," here in Pasoeroean, and the initials "P.O.J." are known by every progressive sugar planter in the world.

This end of the island deserves close study and I was bitterly disappointed that neither the condition of my health nor the approaching season of few and crowded steamers made it seem wise to postpone our departure.

Disappointed and regretful that we could neither see the dry island of Madoera nor the picturesque island of Bali, we sold the car and took passage by steamer back to Batavia.

I had gathered together many interesting seeds on the trip, among them some of the durian, that most spectacular of all fruits. These came from a fruit I had bought fresh from a tree in the mountains as we were coming through. It had little smell when we bought it and Mrs. Fairchild and I wondered why there was so much objection to a fruit that has such a wealth of flavor about it. We both enjoyed it very much and imagined we might become addicted to its use, but, as the day wore on and the fruit got warm we began to get its odor, even though we had tied the great spiny thing to the running board. By the time we got to Soerabaya its odor was distinctly disagreeable, so I turned it over to one of the boys to eat and to clean the seeds. He brought the seeds back to me in some mailing tins, closed up tight, and we took them on board the steamer to pack for sending home. We put the cans on the window sill and opened them; there was no mistake, they smelled. Still we hoped to escape the censure of the Captain by wrapping the seeds up quickly and getting them into the peat without annoying any one with the unmistakable durian odor. We congratulated ourselves that we had succeeded, until the next day, when we met a charming Judge from South Africa who occupied the next cabin and he admitted that he had been the recipient of whiffs of its perfume which the breezes had wafted to him from our window.

I felt distinctly guilty while I was packing up these durian seeds, for my old friend and patron Barbour Lathrop had once threatened to sever all friendly relations with me, if I ever made an attempt to introduce "the d—n tree" into the United States. On one of our trips he would not let me come near him for twenty-four hours after I had eaten one, yet Alfred Russell Wallace declared it worth a trip to Java to taste it, and among the head hunters of Borneo it is so beloved that they will commit murder for the possession of it. According to a monograph by Beccari, there are many forms of the durian in Borneo, some of which produce their fruits near the ground, and I am convinced that some daring horticulturist will one of these days bring into culture a refined durian which may become the rage and be carried back and forth across the Tropic of Cancer by airplane.



There are said to be about 250,000 described species of beetles. This one, a Dynastid, belongs among the largest of the insect world, the rhinoceros beetles, which are not uncommon in the Oriental tropics. This photograph, by Graham Fairchild, taken in Buitenzorg, is nearly twice natural size.

The first plane to arrive at some northern custom-house with the durian, as it is now, will be apt to create a sensation among the officials!

We found Graham glad to see us back in Buitenzorg but sorry to think of leaving such a wealth of insect forms behind.

We had conferences and a tea with Dr. and Mrs. Cramer, whose hospitality we can never forget, and saw Mr. Ochse, who presented me with some splendid specimens of pink shaddocks from his fruit station near Batavia where I had spent a day. These finished our experiences, at least the botanical ones, in the Dutch East Indies and we sailed away from Java, I for the third time, with keen regrets.

CHAPTER XXXIII

SINGAPORE, SWITZERLAND, SWEDEN AND AMERICA

DR. H. N. RIDLEY, who was for many years Director of the Botanic Garden in Singapore, had told me, when we were in Kew, of a row of trees of *Garcinia hombroniana,* near the reservoir in Singapore, and I was desirous of seeing them. I wanted also to pay another visit to the Garden where in 1896 I had first met Dr. Ridley at the very time he was making the discovery of an efficient tapping method that was to turn the planters' attention to the Brazilian rubber tree.

I had often been there before, the last time in 1902, and I was surprised and disappointed to find so little that could be called improvement. The town has grown, but it is still the hodgepodge of races and ships and poor hotels, and sports, and native shops and shipping offices, that it used to be, only that to the mixture has been added the motor car. The pretty trees on the mall have been neglected, the parks seemed to be in rather a dilapidated condition, and even the Botanic Garden, which I used to love, has been robbed of the very portion I had hoped to see once more, the area where the first rubber trees stood. There was even talk of a transfer of the botanical activities in Singapore to Kuala Lumpur in the interior of the Malay Peninsula where there would be room for expansion.

Mr. Best, the Curator of the garden, gave me every help, and together we filled several wardian cases with selected Malayan plants that I found in the gardens and in the markets of Singapore. I added seeds of seven species of Garcinias to my collection (*Garcinia dulcis, G. dulcis* var. *pyriforme, G. hombroniana, G. nigrolineata, G. Kydia, G. Forbesii, G. Griffithii*) and learned to my disappointment that all of the Garcinias in the garden are of slow growth and large size and not so promising for stocks as I had hoped they would be, but I trust they are going to be useful in any breeding of the genus which may be undertaken.

The bread-fruit and jack-fruit trees had always so overshadowed in my mind the other species of the genus artocarpus that I had paid little attention to any but these two, although there are several which deserve to be grown in the Western Tropics and in South Florida as well. There are in fact sixty species listed in the literature, all of which should be investigated for their edible fruits and because they are superb shade trees. I found in the Botanic Gardens *Artocarpus polyphemia,* the fruits of which the Malays appreciate above that of the jack-fruit—calling it "Champada," also the *A. gomeziana* with small edible fruits, deep crimson inside, and *A. odoratissima,* a most promising form sent by Wester from the Philippines, and the *A. superba,* which is one of the most stately trees of the garden.

In the markets there were for sale two species of the velvet tamarind (*Dialium laurinum* and *D. maingayi*), much like the ordinary tamarind in flavor but with almost black pods. They break easily between the fingers, and the fruit flesh inside is refreshingly sour, and some day I expect to see the children cracking and eating them in South Florida. I saw for the first time the *Eugenia grandis* used effectively as an avenue tree and got a lot of seed which has grown well in America.

I had a hectic time trying to get my empty wardian cases out of the customhouse so that I could fill them with plants. The customs officer was playing golf and was utterly unsympathetic, and I came to the conclusion, as I imagine others have before me, that a passenger with only one day to spend in port can have his feelings aroused to white heat when he finds that a government official has coolly taken a holiday and left nobody with authority to act in his place. A callous official has no more place on our national frontiers than has a Soviet propagandist in our parlors, for he spreads a stream of national hatred which lasts for years and influences unfavorably great bodies of people.

Singapore with its noisy second-class hotels and utter lack of sewage is no place to be in if you are not well, and I left it with the feeling that I never wanted to see it again.

We had shipped on the only boat with available space and found ourselves on American territory, for the boat was one of the Dollar Line, and the table with its California fruits and vegetables was in strong contrast with all the boats we had been on since leaving Europe.

What a struggle we had with the First Officer when we asked permission to put the wardian cases on deck! He had once transported some animals for a Zoölogical Park and some of them had gotten loose and been killed, and he had been blamed for their death, and he evidently did not trust my plants not to do the same. It was only by agreeing to take all the responsibility that I was able to get him to accept them at all, and then they were only allowed on the poop deck, where they had to be covered with sail cloth during stormy weather and during the scorching middays in the Indian Ocean to protect them from the salt spray and the rays of the midday sun. These conditions were anything but ideal and I wonder that so many of my treasures reached America alive, some two months later.

We steamed up the coast of the Malay Peninsula whose unexplored jungles contain literally thousands of species of trees which are known only to such men as Foxworthy, the American forester whom I was disappointed not to visit. How many of these plants would make their homes in South Florida or how many will ever come into use by man is idle speculation. The development of the Malay Peninsula seems to have lagged somewhat from all I can hear, and it will always be handicapped in comparison with Sumatra because of the fact that it has no such large high tableland, the highest area being a peak 7200 feet high. The peaks on the elevated Plateau or Bovenland of

Sumatra go up to 9800 feet and even to 11,000, offering a place of escape from the heat of the lowlands.

We stopped for a few hours at the little island of Penang which I had visited several times before and whose gardens and private houses scattered around among the palms have always particularly appealed to me. To my delight the fruit stalls were filled with mangosteens, there were so many of them that they were piled in great heaps on the ground. Knowing that Wilson Popenoe was starting an orchard of mangosteens at Tela, Honduras, for the United Fruit Company, I bought hundreds of these fruits, intending to have the seeds cleaned and sent to him. After I had bought them I tried to bargain with the Chinese fruit dealer to get them cleaned, thinking that there were children enough about to do it for him, for the pleasure of eating the fruit. Not at all, he wanted more for cleaning them than he did for the fruit. I could not help contrasting the scene in Dr. Hill's drawing-room at Kew with this situation. On the one hand the Director of Kew with a small tray of a dozen fruits, on the other, piles of them tumbling around on the ground. My taxi driver, however, came to the rescue and he and his pals ate all the fruits while we were having dinner, and delivered the seeds to me as we came out of the hotel. I hear some of them are now growing into trees in Honduras.

In the Botanic Garden, which is a little gem of a place, a park rather than a garden, the wild Rhea monkeys were amusing the tourists, playing on the roadside and eating nuts out of their hands. I thought there might have drifted into the garden some species of Garcinia or other rare tree which I might get seeds of in passing, and I was rewarded by a sight of the *Garcinia bancana* which is a very handsome ornamental tree and bears edible fruits of a golden yellow color much like those of *Garcinia xanthochymus* and like it, extremely sour, as sour, let us say, as those Japanese plums which people grow in their gardens in New England, and are so enthusiastic about.

From what I had seen of the mangosteen groves in Sumatra, Ceylon and even Java, I had the notion that the tree likes a clay soil which is very retentive of moisture, but I quite changed my mind after seeing that the trees here were in much finer condition and more vigorous and fruitful, the soil being a deep sandy loam with plenty of humus in it, and I predict that it will be on such soils that the great mangosteen orchards of the future will develop.

The steamer stopped at Ceylon where we picked up some wardian cases that Mr. Parsons had very kindly filled with plants from Peradeniya, and soon after that we had a sample of the Southwest Monsoon, only a small sample, fortunately, for there was a stickiness and mugginess about the wind that was very oppressive. I used often to look at the great waves and be thankful that we were on a 10,000-ton steamer and not on the Utowana in such a sea. There would have been no microscoping on her in a Southwest Monsoon.

At Suez a party of us got off, and in dilapidated motor cars crossed the desert to Cairo in a temperature of 110 and a humidity which could hardly have been over ten per cent, getting a thrill out of the contrast with that which we had just been through in the Monsoon. Instinctively Mrs. Fairchild bundled up in her woolen coat to keep out the extreme heat, just as the Arab does.

The road was as bad as could be, and the caravan broke down twice in the short run, preparing me somewhat for the general dilapidation into which I saw at once that Cairo and its environs have fallen. I used to love the great avenue of lebbeck trees from the Kasr-el-Nile Bridge to the Great Pyramid, which the Khedive Emil Pasha had planted at the time of the opening of the Suez Canal in honor of the Empress Eugenie's visit. I had gathered seeds of them in 1900, from which stately trees have grown that are scattered all over South Florida. I could have wept when I saw that the lebbecks had all been cut down and in their place had been planted the tropical flame tree (*Poinciana regia*), which does not seem to thrive very well there. Advertisements, shacks, new houses, unfinished buildings everywhere! I could not even look out of my window in the Mina House at the Great Pyramid without seeing a cheap gas sign, and then too I resented their having dug out the feet of the Sphinx, showing them to be made of brick. The glamor of everything had vanished and worst of all one of those eternal holiday seasons was on, all the museums were closed for the three days we were there, so I could not see once more the statue of the Sheik el Beled, carved with such consummate skill six thousand years ago out of the wood of the Tree of Life (*Ficus sycamorus*).

Everywhere we saw a mixing of the new and the old in a perfect hodgepodge of architecture and everything else, and I could not help congratulating the French on the wonderful way in which Maréchal Lyautey has tried to prevent this sort of thing from ruining the marvelously beautiful cities of Morocco.

We arrived in Genoa the 23rd of June, seven months after leaving Naples, during most of which time we had been in the tropics, and the stay was long enough to make the landing in a northern climate an experience. I was still under par and had time to muse over the difference between the temperate zone and the tropics. The contrast is greater than I had thought. At eight o'clock at night the soft light was still flooding the room, while in Java it would long since have been dark. Strains of music floated in at the window. In Java nothing but the hum of insects or the occasional thin piping of a flute would be heard. The clatter of vehicles and the footsteps of passing people in the hall and the honk of horns and high-pitched voices reminded me of how quiet the world is in Java where the millions of barefooted people move noiselessly about and talk in subdued tones.

The air was cool and bracing and there was a quality about it which made me feel like doing something in the evening, while in Java an extreme drowsiness generally comes over one after dinner, making the social evening life very dull in comparison with what it is in the North. Next morning, accustomed as I was to rising at daybreak, the first light of dawn awoke me and I found that at four it was as light as at six o'clock in Java. But greater, perhaps, than this climatic difference was the social one. I had not noticed it at the time, but in the Orient I had been surrounded by somber, sober, colorless personalities with whom one seldom jokes or comes into any particular intellectual contact. Here the waiter who brought the coffee attracted my intellectual interest and started all sorts of trains of thought. On the other hand he had on the same clothes he had worn for months and probably had not bathed for a week, which was in strong contrast to the spotless, white-clothed, and daily washed Java "boy" or "Jongens." The rooms, too, with their padded, stuffy furniture full of dust, and the plush carpets, beaten once a season, oppressed me terribly after the bare, washed floors and rattan furniture of Javanese houses.

In the country there were such countless numbers of houses in comparison to the people! Or was it that being white or gray, and big, they thrust themselves conspicuously into the landscape? Where were all the people anyway? Those one saw in the fields were weeding or hoeing or digging much as they do in Java, but there were so few of them to be seen.

The shrubbery seemed small and thinly clad with leaves and somewhat nondescript. The trees seemed to have very small leaves and the colors were vivid, fresh and bright, not that dark full green of tropical vegetation. Had I not passed hundreds of species of trees in the tropical forest which were more interesting to look at? But, on the other hand, we were struck by the quantities of flowers in Europe. We saw more along the roadsides and in the cottage gardens than we had seen throughout the whole of Sumatra and Java. The roadside flowers in the tropics are not worth mentioning; there are lots of weeds, but the flowers are most of them up in the tops of the trees.

The plum trees were in fruit and the cherries also, and I delighted in their flavor, although I was conscious that, had I not already formed the habit of liking plums, I should have found them sour and scarcely fit to eat. As for the cherries, did they not take me back to my childhood and the first trees of any kind which I could climb? Even the rosy-cheeked apples, so hard that I could scarcely bite into them, had a flavor that I liked, though I knew that to a Javanese they could by no stretch of the imagination be considered good to eat. The whole landscape of plants brought a mass of reminiscent reflexes, and while at first I could not get excited about some little insignificant stonecrop, by the time I got to Geneva and visited Monsieur Correvon, I was prepared to go wild with him over a plant which in the tropics could not figure as anything but a curiosity.

To my mind one great joy of a sojourn in the tropics is that it gives you all these experiences and helps you to get a true perspective on life and find how tremendously full it is of change and contrast.

During the time that we had been in Netherlands India, the Utowana had limped back to Europe, making short runs from Aden to Suez, to Cyprus and thence to Naples, showing Mr. Armour that the engines were unfit for long and dangerous runs and making him wonder what to do next. On reaching Europe he decided that he would equip her with new Diesel engines, and before we got out of the Indian Ocean we had a cable from Mr. Armour asking if we were game for another try, to which I wired back "Yes."

By the time we reached Geneva the yacht was in the drydock at Stockholm and at Mr. Armour's invitation to come over to confer with him there, my daughter Barbara and I went to Sweden, flying over the Baltic from Hamburg to Malmoe. We found Mr. Armour in excellent spirits and ready to go ahead. New engines and a new propeller were going in and he was as keen for a cruise as though nothing had happened, but not for the long Indian Ocean run. West Africa was settled on as more feasible, all things considered.

It was the middle of July and the "Northern Venice" was in its glory of motor boating, swimming and house parties at the villas which cover the myriads of little islands in the Baltic. I had not been in Stockholm since 1903 and this was the second time that I had come directly from the tropics almost to the arctic. I found the colors of the flowers extraordinarily vivid and the greens lighter. It was hard to realize that a tree could be thirty-five years old and still not be much higher than a man's head. As I went about with Mr. Armour and was expected to know the little common shrubs everywhere in the parks, I began to realize that I had been struggling so hard with new names that I had quite forgotten many I used to know.

This thirty-year-old gingko tree in the Botanic Gardens of Stockholm is only a tenth the size it would have been in Washington, and reminded me of the fact, too often forgotten by all of us, that a plant grown far outside of its natural range will often lead a miserable existence. This is as true within the tropics as outside of it.

Prof. Rob de Fries, the Director of the Botanic Gardens, gave me many seeds and as one result I have growing in my garden in Nova Scotia a species of rhubarb (*Rheum macropterum*) which formed one of a remarkable collection of these interesting border plants that the former director, Witrock, had gathered from somewhere in Asia. I had to re-focus my mind and arouse a latent interest in such plants as *Cirsium eriocephalum* and *Papaver radicatum*, although, as a matter of fact, one finds no such show of colors anywhere in the tropics as one does in a rock garden near the arctic circle.

Some years ago Prof. C. S. Sargent had wanted me to join him in an exploration of Kamchatka and as I knew there was a man in Stockholm who had been to that out-of-the-world place, I went to call upon him. Dr. Hulten of the Rijksmuseet and his wife had spent many months in what seemed to me, as he described it, nothing short of an arctic jungle of tree alders, through which great arctic bears made trails like those which the rhinoceros makes through tropical jungles on the mountain slopes of Java. I could hardly shift my mental gears quickly enough to realize properly that we were speaking of a country where for *nine months* of the entire year no frost-sensitive plant could live. In addition to the pleasure of meeting Dr. Hulten and hearing his account of a land that few have ever seen, I was much pleased to get from him some seeds of a blue-fruited wild species of arctic honeysuckle (*Lonicera edulis*) which is now growing safely in America. By a curious coincidence, Howard Dorsett was at the same time sending in from Manchuria seeds of the same species, and the plants from the two sources are growing side by side in our Plant Introduction Gardens in Maryland.

After a delightful few days of conference in the shipyards of Finnboda and a new look at the stores for the cruise, we went to Antwerp, where Mrs. Fairchild was waiting for us with Graham and Nancy Bell. After spending August at home in Baddeck, Nova Scotia, we arrived in Washington in September to be greeted in New York as we boarded the train for Washington, with the news that a hurricane had destroyed Miami and blown all our tropical gardens, government and private, to pieces, unroofed our house at Coconut Grove, and blown my laboratory completely away. I am sure that Mrs. Fairchild and I agreed that America could be the most hectic place in the world!

I had to select both a colleague and an assistant to accompany the Expedition, so we pushed on to Washington and found that

Dr. H. H. McKinney, a specialist on mosaic diseases of plants in the Department of Agriculture was keen to go as Plant Pathologist. F. W. Schultz was selected as assistant. Dr. J. M. Dalziel of Kew, who, with Dr. Hutchinson was writing the Flora of West Africa, and whom I had met in 1925, consented to go as Medical Officer. He had acted in that capacity for eighteen years in Nigeria and was keen to see the plants of West Africa again.

Then there followed a sad trip to Miami to cheer up Edward Simmonds, Prof. Chas. T. Simpson and the others who were repairing the ghastly damages done by the hurricane. The dear little Plant Introduction Garden into which for thirty years I had been sending plants from all over the world, was a complete wreck. To wander around in its ruins was one of the saddest experiences of my life. My own garden at Coconut Grove was devastated, but has since recovered.

December ninth found Mrs. Fairchild and me on the "Conte Rosso" with Mr. and Mrs. Frank W. Whitehouse and Schultz, bound for Gibraltar where Mr. Armour was to meet us with the yacht. We bade good-by to Graham, who had to go to school. The two girls had gone back to Geneva in November and Dr. McKinney had gone on ahead to join the yacht at Southampton, where she was going to touch on her way from Stockholm to Gibraltar.

But if we thought life hectic, Mr. Armour must have thought it more so, for between his flights back and forth across the North Sea and his trip to New York and back, he seemed to us to be constantly on the wing, a foretaste perhaps of the coming life in the air.

We had a stormy passage and the boat rolled a good deal and we were all glad when we saw Mr. Armour waiting for us in the Admiral's launch at Gibraltar. The "Conte Rosso" stopped only long enough to let us off and I got lost in the baggage attempting to make sure that it all went on board the launch, and looked up to find that Mrs. Fairchild, who was not going on the yacht, was waving farewell from the steamer as it sailed on to Genoa.

On all the Utowana's cruises we were equipped to give plants away as well as to collect and bring them home, and we had on board about two square feet of growing sod of a remarkable grass, which, as it seldom seeds, must be propagated by planting bits of its rhizomes. It was named centipede grass (*Erimochloa oppuroides*) by the late Dr. C. V. Piper, the noted grass specialist of the Department of Agriculture, because at every one of the joints of its long runners or rhizomes it produces roots resembling the legs of a giant centipede. The original seeds of this grass were found, unlabeled, after he had disappeared in the waters of the Yangtse River, in the baggage of the late Frank N. Meyer, who explored China during so many years for the Office of Plant Introduction. As soon as our old acquaintance, Admiral Sir Stapleton Cotton, came aboard, we introduced him to this grass and he was keen to try it on his own terraces, so, before we left Gibraltar, both his gardener and the gardener of Sir Charles Monro, the Governor of Gibraltar, were supplied with pieces of this sod. If it does as well under irrigation in Gibraltar as it does in South Florida it may spread through the gardens on the Rock of Gibraltar. It is a pity that both its discoverer in China and its exploiter in America are no longer alive to know about the success of this Oriental introduction.

CHAPTER XXXIV

OFF FOR WEST AFRICA

ON the 18th of December we started off down the West Coast of Africa, bidding good-by to Mr. and Mrs. Mott whose unbounded enthusiasm and interest in the coming cruise could not supply the store of health necessary for its discomforts. Maps and charts were spread out and studied, the floras on board were checked up to see if all their parts were there, photographic equipment and seed-drying apparatus and wardian cases were overhauled and the difficult process of really getting acquainted with each other got into full swing. The engines worked beautifully and certain undesirables having been eliminated from the crew it was altogether about as congenial a party as ever pulled out of Gibraltar.

Dr. Dalziel was the only man on board who had ever set foot on the coast and he regaled us with stories of the early explorers, particularly of Nigeria where he had been Medical Officer and where his love for systematic botany had led him to collect extensively.

We were taking advantage of the only months during which a boat of small tonnage can safely navigate the West African Coast, for there are very few harbors and the whole sweep of the great Atlantic piles up in rollers on the shelving beaches in such fashion that sometimes even large steamers hang off-shore for a week before they can land anyone through the surf. In April and May storms arise with great suddenness and severity, making a coast with nothing but open roadsteads, a mighty inhospitable place for any kind of a craft. We had before us then, three and one-half months in which to get a glimpse of a coast line which is fully 4300 miles long from Gibraltar to the point where the Equator cuts the coast of Africa. We spoke of the mouth of the Congo, but felt pretty sure that we should not reach it in so short a time, for there are sixteen colonies or independent states that come down to the coast of West Africa above the Equator, and we meant to stop at eight of them. This was to be a quick run into the great Bight of Biafra and back before the storm season came on.

Before America was discovered the Portuguese had sailed down this coast and had brought gold from the Rio de Oro and the Grains of Paradise from what is now Liberia. It was hard for me to realize that we were going to a region which had been the battlefield of politicians for over four centuries and that one fort was still standing which the Danes and Portuguese had struggled over fully a century before our forefathers signed the Declaration of Independence. The Dutch, English, French, Danes, Portuguese, Spanish and Swedes during the 17th century seem to have alternated in their so-called "control" of this vast coast. What that "control" consisted of can be well imagined when one stops to think that not a Danish or a Swedish family can be found between Gibraltar and Fernando Po to-day, and if all the Europeans who are now resident there were gathered together they would not make a fair-sized New England town.[1]

The most daring seamen of the then European world had no other field to explore, once they knew the Mediterranean. Even Herodotus before the Christian era, pictured it after a fashion on his map of the known world of his day, 450 B.C. West Africa is, as a matter of fact, hoary with age. But I had been profoundly ignorant of this until I began to study up for the cruise. My memory of Africa only dated back to Stanley's time. I had once botanized in Tunis with the great Schweinfurt, who was the first

[1] R. Montgomery Martin in his *British Colonial Library*, published in 1844, estimates that there were 500 British on the West Coatst of Africa at that time. The Statesman's Yearbook for 1929 gives 8426 whites in Nigeria, Gambia, Gold Coast and Sierra Leone, combined. This is an increase of only eighteenfold in 85 years.

man to go among the pigmies of Central Africa, and somehow I had always looked upon it as an unexplored and hence a new country. Perhaps that idea really is the correct one for it is an undeveloped country still. I did not even know that next to the gold which urged these hardy mariners down this coast it was the Grains of Paradise for which they came, and that these grains were the seeds of a plant I had never seen in any botanic garden or botanical museum (*Amomum grana paradisi*). Even worse than this, it had escaped my notice that these same Grains of Paradise were for centuries the beloved spice of kings and queens, courtiers and common people of Europe, and because they were suspected of being injurious the amount allowed by law in the alcoholic drinks was limited. The stretches of this vast coast were alternately known as the Gold Coast or the Grain Coast and were illy defined in those days.

I had come, then, to a coast which before America was discovered, was famous among civilized men as the home of a condiment quite as common as black pepper is to-day. I am afraid the discovery of the New World made Europe forget West Africa and the region has remained forgotten ever since.

We pulled into Santa Cruz de Teneriffe for Christmas and had a few days there, and renewed our acquaintance with Don Juan Bolinaga. We were too late to taste the giant fruit of *Ficus roxburghii*, but we visited the largest of the Dragon Trees at Icod. I had a chance to see once more the famous little village of Telde, in Grand Canary, where in 1903 Mr. Lathrop and I got some scions of the justly famed Telde orange. The oranges were ripe and I tasted them again, finding them as delicious as ever. They have almost no rag, a skin like a kid glove and a flavor that rivals the best that the Indian River produces. I again sent scions to Washington although, as before, I have faint hopes that outside of its own little valley this variety will prove any better than other sorts which are grown in America. The Duke and Duchess of York were expected in the Canaries soon and one tree had been reserved for them with all its fruit. I heard afterwards that they were only mildly interested in it. Most people take excellence in fruit as a matter of course.

Dr. McKinney picked up an interesting mosaic disease on an introduced tree by the roadside (*Nicotiana glauca*), and found another on the tedera (*Psoralia bituminosa*), which started his centrifugal apparatus to work and has led to some interesting discoveries in this difficult field of the unseen ultra-miscroscopic changes in plant cells.

In the yard of the Hotel Benitez where Mr. Armour arranged a most delightful Christmas dinner, I was interested to find that all the hedges, and there were many of them, were of the Spek Boom of South Africa (*Portulacaria affra*). This curious tree has leaves like the ordinary purslane and stems as flexible and soft as our Northern leatherwood (*Dirca palustris*). I had been told by that old pioneer of botany in Cape Town, Dr. MacOwen, that this spek boom is a favorite food of the elephants in South Africa, and when I introduced it into America I was asked where I was going to find the elephants to eat it. These jibes at my spek boom perhaps as much as anything else made me interested to find in Señor Benitez one whose appreciation of its good qualities had led him to plant it extensively. From what Señor Bolinaga told me I am inclined to think that it may prove to be as fine a forage plant for the goats of the Canaries as it is for the elephants of Cape Colony.

It is four days from Las Palmas across to the mouth of the Gambia River and it was the afternoon of January 4th, 1927, that we dropped anchor in sight of great piles of peanuts and the low corrugated iron roofs of Bathurst. It was not much of a place to look at, but then, most coastal towns in the tropics look squat and untidy. Giant silk-cotton trees threw their shadows over the enormous piles of peanuts and gave them a character of their own. We were at last on the coast of West Africa.

CHAPTER XXXV

THE GAMBIA

GAMBIA must be one of the smallest of the British colonies, and certainly one of its strangest, for it consists of a river, navigable for a hundred and eighty miles or so and a strip of territory from ten to fifteen miles wide on either side of the river. The whole colony is like a finger, projecting into and being surrounded by the French Colony of Senegal. It is chiefly a peanut-growing country, and its people are far from progressive.

We made a visit to Government House and the Governor chided Mr. Armour for not giving him notice of our coming, for had he known that we were coming he would have postponed the masque ball which had just been held, until the arrival of the yacht. Imagine so nearly running into a masque ball at Government House on a tropical night and getting this as our first impression of West Africa!

Governor Sir Cecil Armitage was making a trip up the Gambia River the next day on the Government yacht, a trip that he spoke of with evident emotion, for it was to be his last one, as he was soon to retire. He invited Mr. Armour to accompany him with the Utowana and take part in his last "Palaver" with the native chiefs, and Mr. Armour accepted.

The Governor had advised us to get in touch with the Director of Agriculture, Mr. A. G. Brooks at Cape St. Mary, so the next morning we drove there. It was a newly established experimental station, but showed the skill and taste in its arrangement of material which seems to characterize so many of the trained agriculturists of Great Britain and so few of our Americans. Mr. Brooks and his wife had made a charming garden of plants out of what must have been a dreary enough landscape before. It looked for all the world like one of our own Plant Introduction Gardens and in point of fact was created to serve the same end. Mr. Brooks had recognized the fact that a better grade of peanut was needed than the poor mixed varieties that were being grown in a very casual way by the natives, and he had found, among other strains, one from the Philippines that gave a better yield and produced more oil. From this he had already selected a white recessive strain which he was pushing.

As he had already begun to get all sorts of plants into his garden we looked them over. Along one border stood a beautiful row of the handsome *Acacia addisonii*, an exceedingly rapidly growing species with pods containing a very superior tannin material that I thought might be worth trying in the sandy lands of our Southern states. The most conspicuous tree in the garden was a splendid specimen of the West African ficus named after the explorer Theodore Vogel (*Ficus Vogelii*, Miq.), the first botanist to visit the Liberian coast. The branches of this peculiarly beautiful spreading tree were covered with small red figs and we gathered a quantity of them, cleaned the seeds and sent them to Washington. Already its rapid growth and attractive appearance has singled this species out in South Florida, and hundreds of them are now growing there. It is dangerous to count one's chickens before they are hatched, but I expect to find this species extensively used in Florida, where the birds will delight in its fruits.

Mr. Brooks advised his assistants along the river by wire that we were coming and promised us an excursion in the interior when we returned to Bathurst.

We left in the late afternoon, trailing the Governor's yacht up the Gambia River, which is so broad and deep that good-sized vessels ascend it as far as McCarthy's Island, a hundred and seventy miles from the coast. Its banks are low, and after the mangrove belt has been passed, the forest is scanty along them, so that we could see from the deck of the yacht far back into the interior and observe that the trees were scattered much as they are in the Australian Bush. In the early morning the bright sunshine, making streaks across the dry ground, and the trees casting their long shadows, and the slight haze of that time of day, combined to make a picture which invited you almost irresistibly to wander on and on into it indefinitely. The West African oil palm (*Elæis guineensis*) that African species of our old friend, the Palmyra palm (*Borassus flabellifer* var. *ethiopum*), an occasional West African wine palm (*Raphia vinifera*), and to my complete surprise, the picturesque doum palm, or gingerbread palm, with its striking branching stem (*Hyphæne guinensis*) were mingled together in groupings which would be the envy of any landscape gardener.

A very tangible result of the Expedition is a nine-foot-tall tree of *Ficus vogelii* which, in 1927, was an almost microscopic seed in a small fruit lying under a giant shade tree in the Gambia. Mr. Edward Simmonds, who has grown it and planted it on the rocky soil of the Government Plant Garden at Chapman Field in South Florida, is shown standing beside it. Many hundreds of trees of this species have been distributed.

As we went up the river we found the water alive with schools of fish on every side; small fishes were being chased by larger ones, the fins of sharks giving evidence of the struggle for existence. When we reached Jowarra Creek on our trip up the river the Utowana anchored for the night in midstream.

The next morning Mr. Armour ordered the launch lowered and as we got into it we were instantly conscious of there being myriads of fish around us. They began jumping all about by hundreds in the most spectacular way imaginable; it was as though we were ploughing through fishes. They were small silver perches, the so-called "Zichli" of the Gambia. Judging from what we heard later the Gambia fish are not well known and offer an attractive field for some ichthyologist.

On board the yacht everybody was equipped for the dangers of the Gambia, for every one except myself had been able either at Las Palmas or at Bathurst to get their feet into the mosquito boots which the Medical Officer had strongly prescribed for evening wear. Alas, I have large feet and could get into none of those offered for sale. The stories of the mosquitos began to hum about us as soon as we arrived in Bathurst, and since they may be infected, and since they always do frequent the region of the ankles, the obvious plan is to encase one's ankles and legs in these thin leather boots when dining out in Gambia. The ladies wear white kid ones and the men black leather ones, for with British persistence the forms of society are maintained no matter where you go in British colonies. We were peculiarly fortunate during our stay in Gambia, for it was the cool dry season and we saw few mosquitos and were nowhere seriously molested by them.

A thatched shade had been put up by the natives of the little town of Kerawan on the Gambia in which to hold the palaver, and with the greatest ceremony imaginable the Governor arrived, with flags flying and tom-toms sounding. The principal chiefs decked out in white robes marched in front, just behind the flag, while the Governor's Aide and Dr. Hopkinson, the Commissioner, walked beside the Governor. It was a very solemn affair, and we were accorded places of honor under the canopy of palm leaves.

The palaver began in English, translated into the dialect of the

Gambians by the official translator. It was about peanuts. The Governor told the chiefs that the Gambia peanuts brought poor prices on the London market because they were not properly cleaned and sometimes had stones and dirt among them. These facts were communicated to the chiefs in the course of a ten-minute speech and then the Governor with some considerable show of emotion told them that this was his last visit to their region, as he was going back to England.

One chief after another replied saying that he would try to do better in the matter of cleaning the peanuts and all expressed regret that the Governor was not coming any more. Then the palaver closed with the same dignity with which it had begun, ending with a procession down to the Governor's yacht anchored at the bank a half-mile below. I have been present at royal functions, but I have never seen a more dignified representative of His British Majesty than Governor Armitage.

I could not help contrasting this palaver in the Gambia with one Mrs. Fairchild and I attended among the Blackfeet Indians in Montana several years ago, where the center of the stage was taken by the Indian Agent, and where there was more discussion of agriculture and much less formality, for the Indian Agent is a very small person compared with the Governor of the Gambia, regardless of the fact that his reservation is comparable in size.

The palaver finished, we inspected the little Plant Introduction Garden and the galvanized iron peanut storage house which Director Brooks had built. I heard some criticism of the expense involved that seemed to me unjustified, particularly in view of the expensive overhead of the general administration and the very backward character of the peanut culture of the Gambia.

Our botanizing around Kerewan introduced me to my first West African fruit, the "Tamba Koumba" (*Parinarium macrophyllum*) and prepared me for the worst, which is that West Africa is mighty poor in native fruits. The Tamba Koumba is dubbed by British residents the "rotten plum" and from what I saw, it deserves the name. However, it will grow on dried-out lands that are often flooded with salt water, and may be useful as a windbreak tree on such soils in America. On these same soils we also found a promising looking grass, *Eragrostis tremula,* of which we sent in seeds.

Dr. Hopkinson, the Commissioner, lunched with us on board and then in the launch we made a side trip up the Jowarra Creek, a typical tropical stream with tangled vegetation coming down to the water's edge. I realized, as McKinney killed a pretty little fly that had alighted on my coat, and Hopkinson identified it as a Tsetse fly, that we were in the region of sleeping sickness. It is so abundant on this part of the Gambia that, as Dr. Hopkinson expressed it, "No cattle would be able to live a week in the forests bordering the creek we have just been in." Yet he felt no hesitancy in visiting this region in the course of his work of inspection and has been bitten many times by Tsetse flies. They do not all carry parasites that are in the right condition to infect one, and he took his chances, just as one does when one motors to town. The chances of getting the loathsome disease which causes death by starvation because the patient is too sleepy to eat, are no greater in the one case than those of being hurt or killed in a collision in the other, I presume.

The forests at the water's edge became more open as we went up the river and we saw more and larger specimens of the famous baobab tree (*Adansonia digitata*), and at Kudang we were really among the typical West African trees and palms. Back of the Commissioner's compound was an unmistakable species of *Bombax*, its bright red flowers, spiny trunk and naked gray branches silhouetted against the sky. It turned out to be *B. flammeum,* and thanks to Major Brooks, who later saved seeds from the tree, we shall have a chance to compare it with *B. malabaricum,* the so-called "kapok" of our Southern gardens.

Having been in the Palmyra palm groves of Ceylon only a few months previously, it was most interesting to find here a palm that seemed almost identical with the Palmyra, save that nearly every specimen had a pronounced bulge in its trunk. By some botanists this bulge is not considered enough to be mentioned in their descriptions, but by others it seems sufficient to entitle it to be called variety *ethiopum.* I prefer the Indian form, just as I personally prefer the Indian elephant to the African species. After seeing this Palmyra palm in both Asia and Africa, I feel more than ever convinced that it should be one of the landscape palms of South Florida and, if necessary, I intend to introduce it again and again until it is established.

The trunk of the baobab is deformed by the continual barking of it by the natives, who make rope out of its fibers.

But the baobab! What can one say of a tree which for centuries held the center of the stage as the largest and the oldest tree in the world? Even so keen an observer as Alexander von Humbolt called it "the oldest organic monument of our planet" and Adanson, after whom it was named, estimated a tree he saw in this region as being 5150 years old. What method of measurement he had which gave him the last one hundred and fifty years is hard to comprehend. With the discovery of California and Australia there departed all the glory of the baobab, for no one could think for a moment of comparing the tallest baobab, which does not exceed seventy feet in height with the four hundred-foot sequois or eucalypts. It spreads out on the ground like an African termite nest and has an antedeluvian air about it which should have entitled its seeds to a place in Noah's seed collection in the Ark, but it is not particularly beautiful. Its leaves when dried form a condiment much used in soups by the natives and I have wondered if these dried leaves may not have originated the use of dried sassafras leaves by the darkies of our South as the "filet" in their gumbo soup. Its fruit is an immense pod hung on the end of a long stem and filled with chalky-white chunks. So curiously chemical are they in appearance that Mr. Armour wanted to know what kind of material we were packing our seeds in when he saw a box of them that Major Brooks had sent to the yacht. These chunks, each containing a seed, have a pleasant taste of cream of tartar, which makes them prized by the native, though it is for the extremely tough fiber of the bark out of which they make rope, that the tree is particularly cherished, and one sees that all the

The pod of the baobab tree contains a mass of seeds which are covered with a white arillus that looks like cream of tartar and tastes something like it, too.

trees near the villages have had great patches of their bark stripped from them, for generations perhaps.

I cannot refrain from mentioning an incident which occurred in the library on the yacht when Dalziel and I were discussing this famous baobab tree. He is joint author with Hutchinson of a new Flora of West Africa and he called my attention to the fact that the frontispiece of the new book was an artist's rendering of a baobab tree. I looked at it and noticed at once that, although the tree was correctly given, the artist had entirely overlooked the fact that the great pods hang on long fruit stalks, like pendulums, and had attached them to the branches with the usual short stems of ordinary fruits. "Yes," said Dalziel, "I was much disturbed about that, but it was not discovered until it was entirely too late to change it." Turning to the great German work, Engler and Prantl's *Pflanzenfamilien*, to see how the tree was pictured there, I discovered that quite independently the German artist had done the same thing, omitted the peduncles from all of the fruits. If one needed an argument for the use of photographs instead of drawings, here it is.

McCarthy's Island with its little village of Georgetown is at the head of navigation for large boats, and we found it a very interesting place for we could botanize in all directions from the yacht. Iron Stone Ridge lay a morning's walk across the island in the South Bank Province, and when I first began scrambling up the ridge I thought that I was walking over recent volcanic rocks of a red color, for the edges were so sharp they cut my boots. It proved to be a regular laterite soil which covers thousands of square miles of the African continent and which seems to be formed only in those zones subject to the terrific light conditions of the tropics. It is clay, baked into great chunks and then broken up, the most discouraging looking soil I ever saw. Yet we saw some splendid shade trees, *Sterculia tomentosa,* and *Bombax buonopozence*, and at the foot of the ridge were cultivated fields of sorghum and a large native village. On this trip we passed the famous ordeal tree (*Erythrophlœum guinense*) whose bark contains a poison that is administered in the trials by ordeal, where those who are immune to the poison are "proven" innocent of whatever may be the crime for which they are being tried, and those who are not immune are "proven" guilty. Some critic of our American courts might perhaps remark that trial by jury is not much worse, as juries are now constituted.

The bales of pearl millet and the bundles of sorghum of poor quality, the pumpkins growing over the thatched huts, and the miserable little gardens of egg plant and peppers, showed that the agriculture is at a very low level, and I despaired of finding among the cultivated crops anything important enough to collect. However, at a corner of a dilapidated street in the village, I found a large ficus tree, literally loaded down with fruits the size of a pea and of honey sweetness. I am waiting to see what this tree does in South Florida, and I wonder whether it will be only the mocking birds and cardinals and other birds that take a fancy to its fruit. Dr. Dalziel identified this as *Ficus Spragueana*, Mildbr. & Burret.

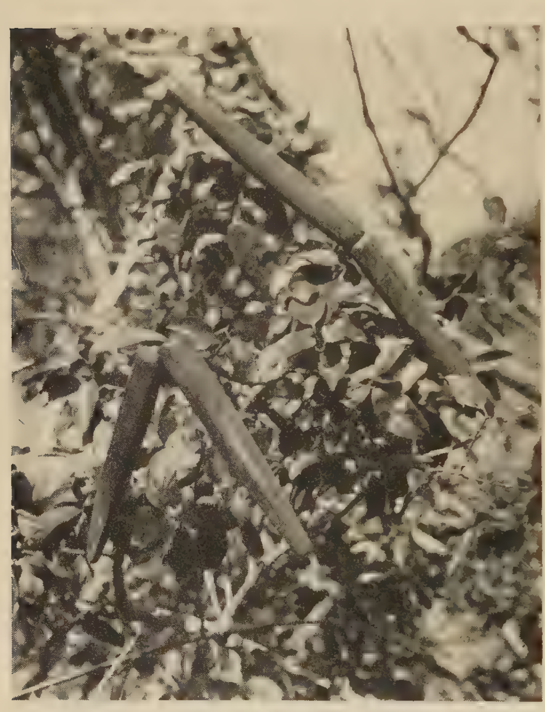
We had a chance to study the Guinean species of branching palm (*Hyphæne guinensis*) and decided that it deserved to be distributed widely through Florida, even though it is of slow growth and it will be many years before it becomes a common object in our gardens.

The Lophira trees were in bloom on the north bank of the Gambia. Dr. Dalziel had talked a good deal about the beauty of their pink leaves as well as their cream-colored flowers and I must confess that I share his enthusiasm, for nothing could be prettier than the combination of those long sword-like delicate pink leaves with the great masses of flowers into which the tree bursts in January. Alas, to see the blooms of a tree is to miss the seed, and to this day no seeds have come.

Mr. Macklin, the Commissioner of Georgetown, had a car with which he very kindly offered to run Dalziel and me across country twenty-five miles or so to Kuntaur where we could pick up the yacht, so that we could see something of the vegetation and collect along the route. We scattered from the car every half-mile or so, each wandering off by himself in search of plants. I began to get some idea of the keen pleasure Dalziel used to have when he was stationed in Nigeria and could wander in search of plants through the sparse brush and small trees of a savannah that is much the same in general appearance for thousands of miles along this great coast. It was a relief not to have to cut my way with a klawong and to be able to wander over level stretches of ground. It is true that grass fires had blackened great areas, burning up the underbrush, but since the trees or climbing vines were what interested us most, the fires did not interfere so much with our work.

In 1903 I had introduced the so-called kaffir orange from Natal into Florida, and my friends had joked me a good deal for doing so, until Mr. Johnston of Homestead found he could cut the hard-shelled fruits into halves and sell them, not only for fruits, but for ash trays, and make a profit. I had never seen but the one tree in Africa from which I took the fruit, and it was exciting to run across it here among all sorts of other strange trees; trees as wild as the hyæna that had left his trail on the ground beneath its branches the night before. *Strychnos spinosa* has come to have a different meaning to me since I saw it in the Gambia, and when I mix my next drink of its fruit flesh in ice and sugar and water in Coconut Grove, I shall drink to its health, for it is an interesting tree.

As we were driving along, Dalziel suddenly became quite excited, for high in the branches of a forest tree he had seen the characteristic "steer-horn" fruits of the Strophanthus vine that he had been looking for ever since we started, two great green pods fastened together at their bases just as are the pods of the ordinary milkweed at home. We tried our best to pull the vine down but it was too firmly fixed in the tree tops and Mr. Macklin had to go to a neighboring village and bring an axeman to fell the tree. *Strophanthus sarmentosus* is one of the sources of about the most virulent poison known, strophanthin, a heart stimulant and one of the most valuable of the newer plant drugs. Its properties were not discovered by civilized man, for he has pretty nearly stopped trying new plants to see if they are poisonous, but by the natives of West Africa, who make a decoration of the seeds in a way described for the first time by Dr. Dalziel, and into this they dip their arrows. When it is remembered that enough of this strophanthin can be carried on the point of a pin to cause death in fifteen minutes, some idea of the value of the discovery to the tribe can be appreciated. Later we were to see this remarkable liana in flower.



The strange fruits of the Strophanthus vine (*Strophanthus sarmentosus*) which we tore down from the top of a forest tree in the Gambia. The natives make the deadliest of arrow poisons from its seeds, as they contain strophanthin, one of the most powerful drugs known.

I was greatly disappointed in the native West African bamboo *Oxytenanthera*, and I never care to see it again. A worthless, spiny, weedy-looking thing!

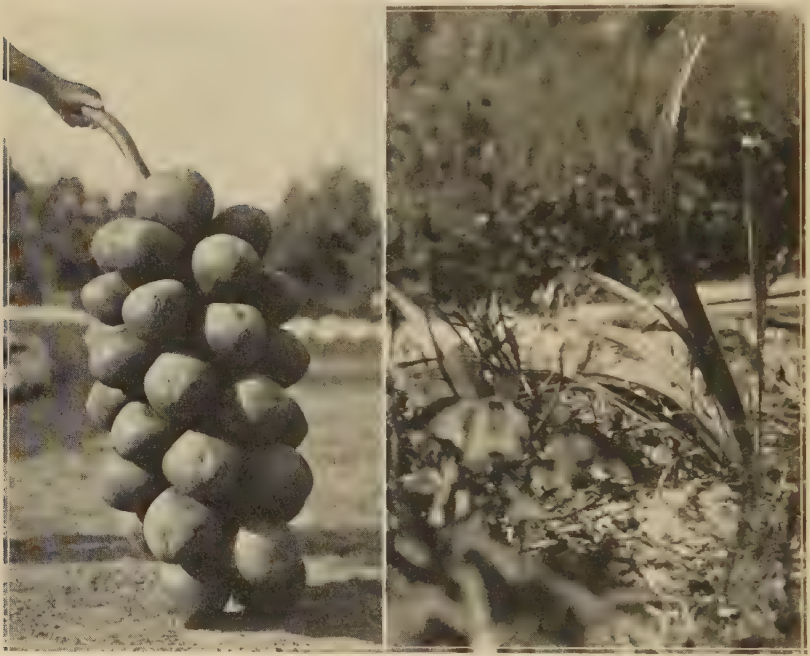
As the day wore on the temperature became hotter and hotter.

The auto top was down and we were exposed to the full force of the sun's rays. We had no water and before we finally pulled into Kuntaur we were in that condition which can only be described by saying that our tongues were hanging out of our mouths.

On our return to Bathurst where we arrived before the Governor's return, we spent a day with Director Brooks, traveling through the low country back from Cape May and through to Abuko and down to Bigelo Beach. There were interesting species of grasses, *Eragrostis tremula* and *Panicum aphanoneurum,* Stapf., which seemed as though they might be valuable in our South; and a tall coarse grass whose large leaves had a peculiar fragrance that was new to me (*Cymbopogon giganteus,* Stapf.), which seemed to me (but not to the others) to have as pleasant a fragrance as that of the lemon grass so much cultivated in the tropics. I had wanted particularly to see, and if possible to get seeds of the West African Palmyra palm and we visited a fine stand of it near Bigelo Beach where, within sound of the breakers that roll in from the Atlantic, hundreds of acres were growing.

Dr. McKinney with a giant calabash which he found growing in a field in the Gambia. These gourds furnish the natives with many household utensils.

The native plantings were pretty poor, but in one that seemed abandoned Dr. McKinney found an immense calabash, about the largest I ever saw, and we took it on board. I have always loved big gourds, and had once spent my winter evenings scraping the outer skin off of the South African pipe gourds I had grown in my garden; so, thinking to make a beautiful wastepaper basket out of this fine-looking calabash, Mr. Armour carefully scraped it and polished it, and then dried it, but it was too green, and in drying split into grotesque forms. One sees these calabashes everywhere in West Africa, generally on women's heads, filled with food of some kind.



Left—A single fruit cluster of the Gambian Palmyra palm (*Borassus flaberifer* var. *ethiopum*).

Right—This, the largest Palmyra palm on the North American continent, made its start from seed collected by the Expedition in 1927 in West Africa. Chapman Field Plant Introduction Garden, near Coconut Grove, Florida.

Director Brooks had cut for us a number of inflorescences of the

Palmyra palm (*Borassus flabellifer* var. *etheopum*) both male and female, of most exquisite beauty of form. I kept the male flowers about on my microscope table for weeks until one morning I discovered that they were shedding great piles of chocolate brown spores. For a week these poured out of the inflorescences and every morning I would brush them into a glass and the next day there would be another lot of them. I found on examination that an amazing ascomycete had made its home under the skin of the flower spike and that out of countless myriads of asci these enormous masses of brown spores were being expelled. I can heartily recommend this subject for any study of ascospore formation.

Just before leaving Bathurst we learned that the banker of the town, Mr. James Howie, had a wonderful garden in his compound, and that Mrs. Howie was very fond of flowers, so we called and saw what fertilizers and water and a Scotch knowledge of gardening could do at Bathurst. Incidentally I discovered in a garden near by the most amazing Sapadillo tree I ever saw, perfectly gigantic in comparison with those I was accustomed to in Florida, and although I know that *Achras sapota* is a West Indiana species I could not refrain from getting Mr. Howie to send seeds from that tree.

The Governor had threatened that if we stayed long enough he would have another masque ball at Government House, and while we had no fear of the hippopotami which we had seen at a distance blowing in the river back of Georgetown, nor of the hyænas which we had not even heard howl, we were all afraid of a masque ball, and on January 12th left for French Guinea. I think all of us left with keen regret, for the Gambia River is an ideal waterway. The residents of course encouraged us to think that if we ever came again we might find the Georgetown region swarming with mosquitos, but on this occasion the owners of the mosquito boots had paraded their shanks to no particular advantage.

CHAPTER XXXVI

FRENCH GUINEA AND SIERRA LEONE

We called in at Konakry, the principal city of French Guinea, to see if it were a place at which to stop again on our return journey, and found it was. Dr. Dalziel had heard much of the Fouta Djallon Mountains and knew them to be the highest in this part of West Africa and we thought of making a run up into them.

In leaving Gambia we had left the drier region of West Africa behind and plunged into one of the really rainy regions of the globe, a region with a rainfall of 324 inches. Washington has only 70 inches. The vegetation reflected this heavy rainfall and even before we left the quay at Konakry we saw one of the most remarkable silk-cotton trees, indeed one of the most striking trees of any kind that I have ever seen. The specimen that appears on all the postals from Nassau and which attracts so much attention is a mere pigmy in comparison.

The rikisha is in use in Konakry and from in front of the "very decent" hotel we took them for a trip to the Jardin d'Essais. The street was planted from end to end with great mango trees that shed a deep and very grateful shade, quite convincing me of the value of the mango as an avenue tree, at least in places where the falling of the fruits is not an objection. They were planted by the late Governor Ballay and certainly do him great credit, for they not only give much needed shade, but when they are in fruit they feed the city population with mangos. They are, unfortunately, seedlings of the stringy type, instead of being fine grafted varieties.

We had seen the nests of the weaver bird in the Gambia, but in Konakry we drove under coconut palms whose long pinnate leaves seemed almost completely converted into weaver bird cities. The male and female bird weave their nests out of strips of the coconut palm quite as cleverly as a basketmaker would make a basket, working together, and with incredible speed. While the nests are not so large as are the hanging nests of the Oropendulas of Panama, they look more like baskets, and the weave is more regular. What keeps the birds at work until they have completed such perfect structures has always puzzled me, and how do they know that it is time to stop? How complicated must be the reflexes that function in such cases!

Every once in a while we saw a splash of crimson among the dark green foliage of the roadside vegetation, a color even more brilliant than that of the red maple as it stands out against the dark spruce trees in Nova Scotia. The rikisha coolie got me some of these red things and they turned out to be the fruits of *Cnestis ferruginea*, D.C. They looked like the long-beaked seedling peaches which are sometimes found in Florida, only here and there one of them had opened and showed a chocolate-brown seed inside. I wanted to see some of them in the tangle of hammock vegetation of South Florida and collected some seeds.

The Jardin d'Essais had a number of interesting things in it and had evidently contributed considerably toward the welfare of the colony. I was particularly surprised to find quite a little orchard of the mangosteen, and of another species of Garcinia which the man in charge assured me was the "Abricot d'Afrique," but which unfortunately had only two small fruits on it. Several grasses which were new to me were being cultivated, and from the way the oxen were consuming one of these I wondered if we had not stumbled on a valuable new forage grass for Florida. *Pennisetum setosum* and *Eragrostis tremula* were both common, but have not been very successful in America, I am informed.

As we had another day in Konakry while the yacht was filling her tanks with what is reported to be the best water on the coast, we motored out as far as we could go on a good highway toward Forecaria. From one of the trees in a clump of forest on the savannah came the harsh sharp bark of a large baboon, and the driver restrained me from getting too close to it, saying they often attacked.

The ground was that same laterite we had seen in the Iron Stone Ridge of the Gambia, and the vegetation was clustered about wet spots in it. Dense tangles of vines and undergrowth, with sometimes an aroid or two, and all sorts of nondescript small trees and shrubs made up these clumps. On the outskirts of one of them stood a tree of *Sterculia tragacantha*, Mind. whose velvety pods were as brilliant as those of the *Cnestis* we had seen the day before, only these were scarlet instead of crimson. Should this tree be adapted to street culture, some day these masses of color may please other American eyes than mine.

Returning from this tiny glimpse into the savannah vegetations of French Guinea we passed small trees of the velvet tamarind (*Dialium guineense*). I do not remember to have seen anywhere such dead black fruits as those with which the tree was loaded. Although they are in no way related to the true tamarind, they remind one of it by their thin brittle shells, inside of which lies a sweet but rather dry, sub-acid pulp. I thought them as good to eat out of hand as is the tamarind, but do not know that this is saying much. If the velvet tamarind should ever fruit in Florida, as it ought to do, perhaps the little boys at least will be glad we sent it in. I have not yet had the African species and the two East Indian species together to see which is the best. Perhaps they might be improved by interbreeding.

In the hotel we met a remarkable woman, a Miss Fontaine, who had taken up the collecting of tropical insects as a serious hobby. She had been traveling through the colony quite alone and had made most extensive collections of its insect fauna, which, she averred, was one of the richest she had any acquaintance with. Her specialty was butterflies and moths, so she could give us no information regarding the scale insect which seemed to be threatening to completely defoliate the coconuts in the colony. It was later determined by Dr. Morrison to be *Aspidiotus destructor*, not uncommon in tropical America as well as in Africa. There was an avocado tree in a yard almost defoliated by this same pest, and I judge that before much is done in the way of agriculture in this rainy region the pests will have to be better understood.

From Konakry to Freetown, Sierra Leone, is a short day's run and we got there in time for a walk on shore that evening. To me there was something grim and repellant about the town. The poor roads of red clay, the native sellers with their little oil lights, the swarms of independent blacks in a motely array of European clothes, combined with the intense heat to give me a most unfavorable impression of the place. True there were some good brownstone office buildings, while on the hill overlooking a beautiful valley was the European colony with a clubhouse and comfortable bungalows, but after all I had heard about Sierra Leone I did not expect to find its chief city a darky town with no hotel, no laundry and not even a place where I could get my hair cut. I was gradually beginning to realize that after all there are very few white people in West Africa, and white settlements surrounded by a black ocean cannot grow as they can in an uninhabited country. Then too the great bulk of the residents are Government officials who do not ever expect to stay more than a few years and are looking forward to the time when they can go home and live on their pensions.

The Director of Agriculture, M. T. Dawe, had spent a day with me in Washington just before we sailed for Gibraltar, and I had firmly expected to find him here, but he had not yet returned. His place was taken by Mr. K. G. Burbidge, whose office was in one of the several buildings near the Governor's Official Bureau. We called upon him at once and met the Governor's representative, since the Governor was up country, and soon arranged a trip to the Sierra Leone Experiment Station and the site of a new College of Agriculture that is being built near by. I was not prepared for the lack of roads in the colony. A single narrow-gauge railway led to Njala where we wanted to go but Mr. Burbidge was afraid so large a party might swamp the housing facilities of the Station, so we prepared to take our own paraphernalia, including tin bathtubs with covers which, packed full of bedding and other outfit, make convenient head loads for the porters.

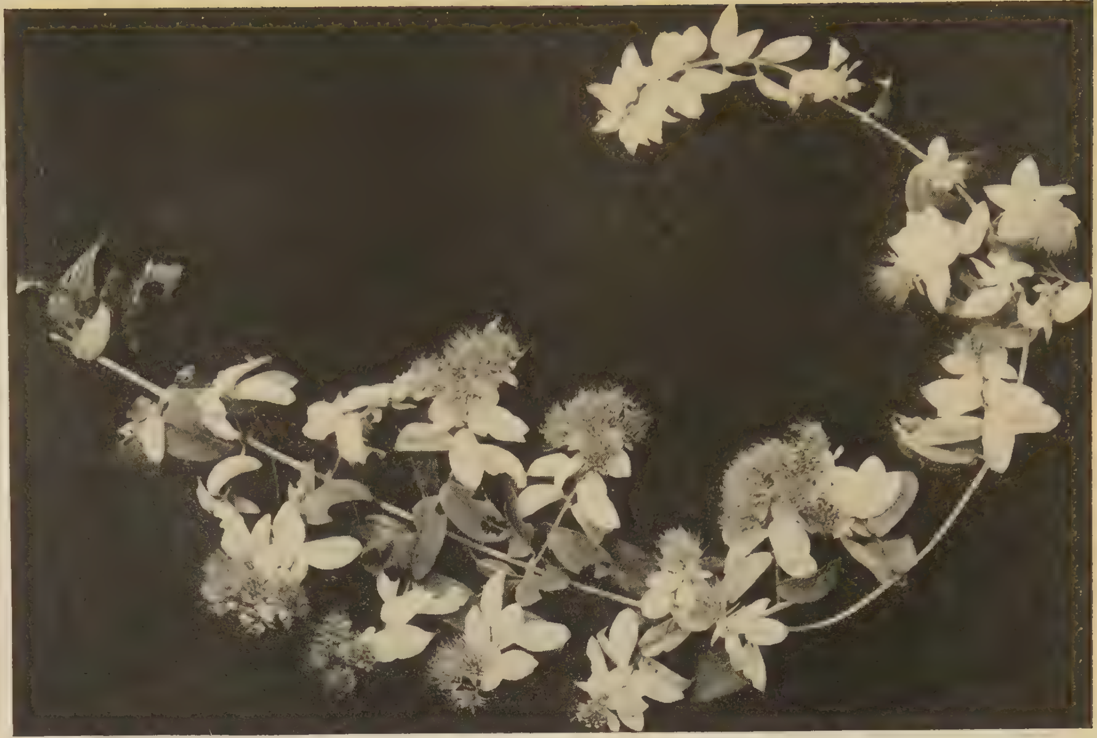
From the way the collecting party came off that yacht in Sierra Leone one would have thought that it was going to strike right through to the interior and I think the swarm of "carriers" who saw us land thought so too. In reality we were simply taking a morning train, but the confusion of it gave us some idea of what travel by "shikari" would be like. I think Mano, our railroad destination, would not have been more than two hours' ride over a good automobile road, but by train it took us nearly ten hours to make it, running into a drunken darky asleep on the track and stopping to investigate him being only one of the causes of delay. Judging from what we saw in this and other colonies I should say the day of narrow-gauge railroads ought to come to an end in the tropics wherever automobile roads can be built.

I doubt if there is a more unique experiment station in the world than the one Director Dawe has built on the banks of the Taia River, a good hour's ride beyond Mano. To an American it seems a bit isolated, when one considers that in order to reach it one has to spend ten hours on a train, then ride for an hour in a truck or be carried in a hammock, cross a tropical stream in a great dugout and then climb a hill on foot. Once on the high bank overlooking the Taia the great thatched bungalows and office buildings are really very beautiful and the view of a typical African stream with jungle on either side and a sand-bank on which all kinds of beasts come and play, is something to be found in none of the experiment station grounds I have visited else-

It is on the bank of this wonderful tropical stream that the Sierra Leone Agricultural Experiment Station is situated. The Taia is typical of the mysterious streams of the West Coast of Africa.

where. Director Fisher, Mr. Moss, Mr. Deighton and Mr. Kemp Small, the engineer who was building the new College, had prepared for us in such a way that our shikari seemed superfluous, and we spent three delightful days collecting in the jungles along the Taia and on the extensive Station grounds. It is a very difficult thing to conduct an experiment station in West Africa; the objectives are so vague. At first sight it seems the obvious thing to do to study the control of plant diseases, the improvement of varieties, rotations of crops, the discovery of better methods of handling the soil, but when these things are all worked out, what then? Think of the business of getting these natives to use these discoveries, of teaching the method of growing better crops to a people who have grown up in an environment of the most incredible superstition and ignorance, an environment in which such a thing as a logical sequence is unimaginable. It takes a faith not much less deep than that of the American missionaries, who for thirty years have had a mission not far from Njala, to believe that something worth while will come out of one's efforts for these people. From what I have seen of tropical investigations I am inclined to think that the problems of tropical agriculture are too profound and difficult to be solved by general demonstration stations.

As I look over the collections of seeds we made at Njala, mostly in the deep jungle, the only ones I think may be distinctly valuable in the Western tropics are the Christmas Bush (*Alchornea cordata*), with long bunches of bright-colored red fruits which the Europeans use in place of holly at Christmas time; *Carpodinus dulcis,* a vine of the large family Apocynaceæ, with a palatable fruit; a handsome flowering vine of the genus *Combretum* which is still undetermined, but whose long showy branches of red flowers would thrill any owner of a pergola, and a stunning looking tree which stood on the bank of the Taia near the director's house and was loaded with small sweet fruits borne in great masses on its trunk (*Drypetes* Sp.).



A remarkable ornamental vine was growing over the bushes near Njala, in Sierra Leone. Its light buff bracts and deep red flowers make it a striking vine for pergolas wherever it can be grown. It is an undetermined species of Combretum.

Mr. Moss very kindly gave me seeds of all the varieties of West African oil palm he had in his plots. He also called my attention to the very curious fact, discovered by Director Dawe, that the most highly prized grass of Brazil, called there "Capim Gordura" or "Molasses Grass" is a wild grass of West Africa (*Mellinis minutiflora*) where it is known as the "Ef Watakala" grass. How did it get to Brazil I wonder, and when?

I was a good deal surprised to see so much effort being made in the Experiment Station to grow citrus fruits, for their culture always means a continual fight against insects and fungi, which can be successful only where labor of a very high grade of intelligence is available and where modern insect-fighting machines can be employed.[1]

The Brazilian rubber tree grows well at Njala and Mr. Fisher showed me trees eleven years old which seemed to me quite as large and fully as vigorous as any I had seen in Sumatra or Java. I have always believed there would be many places on this coast where it would grow, but the question in my mind has been the supply of skilled labor to do the tapping. When I compare the delicate skill exhibited by the Javanese in the building of their houses with the rougher technique shown in the mud huts of the natives of West Africa and realize the primitive environment in which generation after generation of Africans have grown up, I am inclined to think that there is going to be a dearth of capable labor for these West African plantations.

Wishing to see the vegetation along a West African river, Dalziel, Schultz and I, on leaving the Station, took a dugout and the natives paddled us down to the railway station at Mano while McKinney investigated some mosaic diseases he had found on peanuts near the Station. It was a wonderful morning, and the great heavy dugout kept on an even keel, no matter how much we stirred around in it and reached for the great sprays of seed pods of Combretums which hung far out over the water. I left the dugout at one point and penetrated alone for some little distance into the jungle. As I stood looking around me in the stillness I could not help thinking that the jungle was much more like the tangles on a river bank in the woods of Maryland in midsummer than anything else I can think of in Northern latitudes.

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[1] The fact that no emphasis was placed upon the dangers from the Mediterranean fruit fly by these investigators, and that an abundance of mangos and oranges are grown in the villages of the West Coast, would indicate the possible presence of controlling parasites to be found here, as well as climatic factors.

During our absence up country the yacht had been the social center of the colony, as it always seemed to be wherever we were, and Mr. Armour and the Whitehouses knew all about the colony from a side I did not come to know at all.

CHAPTER XXXVII

THE LIBERIAN REPUBLIC

A NIGHT'S run and we were anchored in the roadstead off Monrovia where we could see the breakers rolling in on the beach and make out the President's House among a lot of other galvanized iron-roofed houses on the hills above. We had reached the Republic of Liberia.

It was with the most curiously mixed feelings that I looked off through the glasses at this place. It was the first spot in the tropics to arouse my interest as a young man. Two of my intimate friends O. F. Cook and G. N. Collins had gone out there for the Liberian Colonization Society to see what the prospects were for the betterment of the Liberian youth. During their many months' stay they had cleared the land and built a speck of a house in the jungle at Mount Coffee some miles up the river, that was to have been the nucleus of an agricultural school. They came back with specimens of plants they had collected in the jungles which they let me help study. They got me to join the Society. I was then twenty-three and teaching in a colored Sunday School every Sunday afternoon in Washington, for I had inherited a feeling of responsibility toward the colored race, my father and uncles having been friends of William Lloyd Garrison and builders of Berea College, Kentucky, where blacks and whites were educated together. I had an idea that perhaps I ought to become a missionary myself. Just at this epoch there had come to visit me in Washington, an old schoolmate from Kansas who had become a religious revivalist and had organized a party of missionaries and was leaving for this very spot, Monrovia. He insisted that I should go with him, and I believe might have persuaded me to go had he not tried to convince me that the Lord would take care of his little mission band and that there was no use taking any medicines with him. This idea did not square at all with my scientific beliefs, and shattered my faith in the success of his undertaking. All these memories crowded in on me as we waited to go ashore. I had the original report of Cook and Collins with me; it was a damaging report, about the most damaging report I have ever read, and just before I left Washington I had met the brother of my missionary friend and he had asked me to visit his brother's grave in Monrovia.

While I was musing over the gigantic changes that have taken place since those days, changes in everything, including my own education in the race matters which are involved in any consideration whatever of Liberia, a surf boat came into sight, paddled by what I knew from Cook's descriptions must be Kru boys, and the launch went to meet them and give them a tow line, as the waves were running high. It was the Customs boat, and with the swagger that one associates with petty officials everywhere, the occupants of the boat swarmed on board. Mr. Armour treated them with his usual courtesy, and informed them that the Utowana was a yacht and traveling under papers which gave him the courtesy of the port wherever he landed; that he had on board officials of the United States Government, in short put the whole situation before them, with the result that he was advised that the Liberian Government would station its own representative on the yacht to stay there during the period of our stop in the roadstead. "But," Mr. Armour remonstrated, "I do not need any such protection." "Oh, but it is not to protect you; he is to look after the interests of Liberia," was the reply.

No explanation of the laws of courtesy toward yachts had any weight with them, and they left a young fellow just out of his teens to "watch" the Utowana; a spoiled darky who lolled about the drawing-room as though he owned the boat. This evident discourtesy affected us all and was a bad starter for

Liberia. It did not encourage us to call on the President or have anything to do with the officials of the Republic, and in fact shortened our stay there to twenty-four hours, most of which time we spent in a visit to the rubber plantations of the Firestone Company and in interviews with the staff which the Company has assembled there.

As we were paddled up the St. Paul's River after crossing the usual bar that so seriously interferes with traffic on these West African ports, the town of Monrovia seemed to be rather attractive as its houses looked down on us from the hill, but when we entered it we were completely disillusioned, for like Topsy, Monrovia "just growed up."

Generally there is some faint suggestion of a plan in any of the tropical coastal villages I have visited, and this being the capital of a country having as many inhabitants as Virginia and with a seat in the League of Nations, I felt that I had a right to expect something better. As we were paddled up the stream we passed a picturesque little island where the early "pioneers" are said to have landed, and its thatched huts in their beauty of proportion stood out in striking contrast with the corrugated iron architecture of the town of Monrovia.

We entered the town, and as I saw a lot of natives fussing around before a warehouse I thought there might be a market going on, so hurried to see what it had in the way of fruits or vegetables. I found the usual mixture of men, women and miscellaneous things that make up a tropical market, but with one rather discordant note, the almost universal presence of the enameled wash basin. Yams were in one, cassava roots were piled in another, and in still another I saw for the first time on this coast a fruit cluster of the West African palm, *Elæis guineensis.* At last we were in the home of the oil palm where for centuries, the oily pericarp or seed covering of this palm has constituted one of the chief foods of millions of people, and the species has become one of the lures for planters in Netherlands India.

It was to be expected that somewhere there should be a peanut seller, and there she sat, with cigarettes for sale in an enameled wash basin and peanuts on a tray.

We looked for the entrance to the town. Some rough stone slabs which seemed to mark the site of an old quarry led toward the President's House and the House of Congress. On either side were unfinished shacks and shops, ahead of us was an unfinished building, or was it the remains of a fire? I never have seen so many unfinished structures, both ones that looked as though they had already been abandoned and ones that were lived in while not yet completed. They were too old and weatherbeaten to suggest that there had been a boom and then a drop. I learned later that this is the way of the Liberian. When he gets some money he builds until that money is gone, then waits for better days to come again. He does not know of any other thing in which to entrust his money. He believes in "city" real estate, particularly buildings.

Once in the city square we were close to everything, the House of Congress with its checkerboard roof of corrugated iron in every stage of rusting (what a pity no two pieces rust alike), the President's Mansion with a great frangipanni tree beside it, and the headquarters of the Firestone Company in its two-storied wooden building on the corner. In the square itself, true to the form of our civilization, which the Liberians are following, stand two monuments of concrete, the one an obelisk, the other with columns, a frieze and an urn, while on one face is the figure of a negro giantess touching a match to a toy cannon which is pointed at some toy soldiers marching up a hill. "This monument is erected and dedicated to the sacred memory of Matilda Newport, who during the battle of December 1st, A.D. 1872 performed a valorous deed which contributed in a large measure to the ultimate success of the Pioneers" is the inscription it bears.

On the other side of the square are some shops, and on one corner the American Legation. These buildings constitute the center of the town. On the outskirts I was shown a college, closed for reasons of expense or lack of students, and a half-finished house with pretentious pillars, no two of which were in alignment. I should say that Liberia needed a school of architecture.

We soon found the acting manager of the Firestone Company, Mr. Gooch, and made arrangements to visit the only "estate" in Liberia where the trees were being tapped, that at Mt. Barkley, some twenty odd miles in the interior.

A natural growth of the West African oil palm (*Elæis guineensis*) stretches for miles along the coast of Liberia, where it is at home. No extensive plantings have as yet been made by the Liberians.

This trip, which was over fair dirt roads, the first of any consequence to be built in the colony, gave us a chance to see something of the country. We passed great stretches of West African oil palms which, judging from their height, it must require skill and daring to climb. This difficulty in harvesting the nuts would constitute a handicap in favor of the lower plantation palms of the Dutch East Indies.

We passed a little pond beside the road in which the African pond lily (*Nymphæa maculatum*) was blooming, a pretty white species; great bushes of the scarlet flowered liana *Combretum commosum* were everywhere. On a shapely tree in the savannah a few pods were hanging open as if to expose the brilliant scarlet arillus with which each brown seed was covered; it was *Afzelia bracteata* which Vogel discovered in 1840. Its seeds are to my mind the most attractive of all seeds and worthy of the place they have taken as pendants, both because of their stone-like quality and the brilliancy of their arillus. While gathering the seeds of the afzelia we found that we were brushing against the blossoms of a namesake of the great Napoleon (*Napoleona* Sp.), so named because of the crown-like appearance of the flowers.

Mt. Barkley was an old rubber estate when the Firestone Company acquired it, the trees ranging from twelve to twenty years in age. Started by an English company it was abandoned during the time of low prices, but it has now been brought back, with the former manager Mr. Picket and his young wife in charge. Compared with the plantations that I had seen in Sumatra and Java and Ceylon, this Mt. Barkley estate seemed very much the same. I am no rubber expert and could not from so short a visit pass judgment on it, but I did notice one thing, perhaps because I had expected to find it, and that was poor tapping. The tapped surfaces were too often covered with little buryls which come, as I understand it, when the tapper leaves a bit of outer bark and does not cut clear down to the cambium or injures the cambium by cutting too deep, the very things for which in Sumatra the Javanese tappers are penalized because these injure the tree for later tappings. Not all the trees, of course, were injured, but it seemed to me there were too many with injured cambium layers.

From the trees we turned our attention to the tappers and found an amazing mixture of native races represented, races of people who could not understand each other's language. To watch this gang of men bringing in their pails of latex and pouring them into the tank and hear them try to talk to each other, reminded me of deaf children struggling to make themselves understood. They were in striking contrast with Oriental tappers in one respect, for they were all grinning and had the same old strain of humor that for me has always been the greatest charm of the black man in America. I realized that I was tired of the silence of the Oriental and that the humor of the African was a delightful change. Mr. Gooch, who had been a rubber planter in the Malay Peninsula for many years, declared that he liked the joviality of the West African better than the quiet of the Malay or Chinaman. I asked Mr. Gooch if he had taken over any American negroes, and learned that the Liberians do not want them. I inferred from what he said that they were afraid the superior

Eight races of Africans are represented among the rubber tappers of Liberia. From left to right stand a Grebo, Gola, Gio, Bandi, Buzi, Pessa, Mana, and Bassa. The best are said to be the Bandis, Buzis and the Pessas. They all speak different dialects.

social graces and *savoir faire* of the Americans would prove too attractive to the Liberian ladies.

During the day with Mr. Gooch and Mr. Ehrman of the Firestone Company I learned much with regard to the system of a pay envelope for every native workman, thus eliminating the supremacy of the native chiefs, and heard something of the rôle which politics and religion play in this republic. I went away with the firm belief that I had seen something which was much more likely to convert the black man to civilization than either the religion of the American missionaries or the politics of the so-called Liberians. If men do not earn more they are not likely to change much, and the efforts of missions to convert them to a different religion will not, in my opinion, change them unless it is accompanied by a change in their material condition. The elimination of the chiefs, making the laborers slaves to a pay envelope, instead of to hereditary social groups, will bring about the "civilization" of the Dark Continent more quickly than any other one thing, for the power that comes with money will supercede that now held by intrigue or family and will belong to those who have learned how to work and to save.

On the other hand, Mr. Firestone will have to show that these natives really are potential plantation workers and not merely semi-civilized men who prefer their own periods of "making brush" by burning patches of ground and planting corn, followed by periods of leisure, to the daily grind of a tapper's life.

In botanical literature there appears the name of Dinklage as a collector of plants in Liberia, and, as we heard that he lived in Monrovia, we called on him in his quarters above his store. He had come to Liberia years ago with the idea of growing the African fiber plant, Sanseveria, but as this had failed he had become a shipper and merchant. He showed us his plant notes and gave me as a souvenir some seeds of two beautiful crimson fruits of *Physedera eglandulosa,* which would make beautiful

Christmas tree ornaments. I had found a beautiful *Acacia Dinklagii* on the banks of the Taia in Sierra Leone.

As the evening approached we heard that Mr. Ross, the Scotchman who has general charge of the Firestone Estates had returned and so we called on him. He informed us that from his long experience in Malaya he believed the troubles there from labor unions offset the troubles from inexperience in West Africa, and that so far as soil and climate are concerned, this region has an advantage over the Malay Peninsula, because the tapping is not interrupted by a dry season. He told us also that their concession is for a million acres of land, not all as yet located, although the best rubber land appears to be near the Southern border of the Republic; that a mole to which steamers could tie up was in contemplation, that model villages for the workers were being constructed and that already large clearings had been made back in the interior and the seed collected and planted for future plantations; that the building materials for the construction of houses and sheds are being freighted in from America, and that the dwelling houses of the force are to be screened, just as they are in Panama, and every effort made to reduce the mortality and the sickness, always the greatest problems in the opening of a new jungle country. Already there are thirty in the force of white men, including a competent plant pathologist who has come out to study the diseases of the rubber tree and the physiology of its behavior with regard to latex production.

Shortly before our arrival the expedition from the Harvard School of Tropical Medicine, headed by Dr. Strong, had spent several months in the country and made a more or less extensive study of its sanitary conditions as well as of its flora and fauna. Much of such work will need to be done before the agricultural development of such a vast country, four-fifths as large as Florida and with twice as many human beings in it, can expect to succeed, for such development means a constant struggle with the insect and fungus enemies of mankind, not only of his crops, but of his person; his skin, his intestines, his blood and his eyes.

In the preface to his monumental book on Liberia, Sir Harry Johnston [1] appeals for "at least another half-century of trial before the world in congress pronounces decisively upon the success or failure of the experiment." Twenty years of this period had elapsed when we had this glimpse of Liberia and the prospect was not very encouraging. From conditions we saw there and in other parts of West Africa, I am personally very doubtful if the group of men, politicians and fonctionnaires, who style themselves "The Government" will solve the African problems. Whatever saves Africa, will, I think, have to pay its way.

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[1] Johnston, Sir Harry, *Liberia,* 2 vols. Hutchinson & Co., London, 1906.

CHAPTER XXXVIII

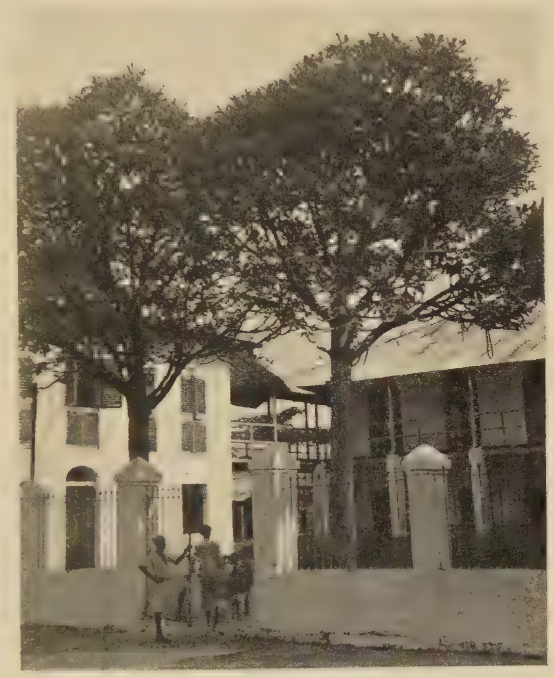
FERNANDO PO, DUALA TO CAMEROON

Every one of us wanted to see the island of Fernando Po—in the first place, it was an island and we could circumnavigate it; in the second place, it had a good harbor and, in the third, we had found that there were a number of very interesting species, particularly indigenous grasses, on which the herds of cattle at Moka grazed. Mr. Armour made a run of five days direct across the Gulf of Guinea and into the Bay of Biafra and landed us in the charming harbor of Santa Izabel with its wooded islands, high headland, and jungle-covered hills in which with our glasses we saw all sorts of fascinating flowering tropical trees and lianas. Clarence Peak, the highest point on the island, was hidden from view by clouds.

What a contrast there was between the beauty and the neatness of this little Spanish harbor of Santa Izabel and the utterly nondescript waterfronts of Freetown and Monrovia! The long whitewashed walls and neatly kept driveway leading up a steep slope to the pretty little Plaza, the avenue of beach almond trees (*Terminalia cattapa*) with their gorgeous tints of crimson, the tiled, roofed white buildings, all gave to the place a most inviting appearance.

We landed, presented our papers at the Governor's Residence and found that he was in the country, as was also the Agricultural Expert at whose office we stopped, but there was a branch of the East African Trading Company in the town and from its manager, Mr. Wilson, we learned something of the conditions on the island. It is essentially a cacao-growing island and Mr. Wilson spends several months each year buying cacao nuts for export.

There is a scarcity of labor which is made up by the importation of coolies from the Rio Muni, a Spanish holding on the coast of Africa. In fact a boat load of these natives had just landed and they were being lined up in front of the large hospital facing the harbor waiting for the doctors to make a blood examination to see if any of them had sleeping sickness. It is the constant dread of the administrators, this disease, and every effort is being made to prevent its introduction from the coast. We found that it would be feasible to walk across the island and come down to a harbor on the San Carlos side and in such a trek visit the grass lands around Moka and see something of the locally noted yams that are grown at Ballacha, where the King of the Bubis lives.



The strange tree from the Gold Coast, *Elæophorbia drupifera,* Stapf., was used as a shade tree before the mission at Santa Izabel, Fernando Po.

As we were waiting for the Governor's Secretary in front of the Residence, my attention was attracted to two strange looking trees growing in the yard of the Catholic Mission across the plaza. Dr. Dalziel at once recognized them as trees of *Elæophorbia drupifera*, one of the character trees of the great savannah of the Gold Coast. Thinking from his description that the tree might grow on the salty marl prairies of South Florida I collected what seeds I could find in the yard of the Mission. Later we saw many of this species near Winneba on the Gold Coast, but the seeds I collected in Santa Izabel were the only ones we were able to get, for while the other trees were in fruit, the fruit was green.

That night on board, as we were getting everything ready for the excursion across to San Carlos, Mr. Armour warned us that unless the engineers were successful in getting the yacht's refrigerating plant going we stood in grave danger of losing our whole supply of frozen provisions. The cylinders of liquid carbon-dioxide gas which had been purchased in the Canaries were not operating the plant properly. In the morning the temperature had reached the danger point and there was nothing to do but "scoot" to a port where other cylinders of a better gas could be found and save our provisions. The nearest port was Duala, so with disappointment tempered only with the possibility of a return, Mr. Armour and I went ashore to cancel all the arrangements and get the necessary clearance papers.

From the yacht the evening before we had noticed, back of the Casa di Piedras where the offices of the port were located, thousands of birds circling about against the sunset sky. When we reached the building and entered it we found the explanation of this, for the roof and rafters of the building were a solid mass of the nests of this *Golondina*, which is a species of martin. The droppings of the birds were everywhere and I felt somewhat as I did once in Egypt when a German agriculturist took me into his immense dove cote where 30,000 pigeons were nesting.

As we walked back to the harbor we passed a private garden where grew a small shrub over which a heavy net had been thrown, and thinking that it indicated a particularly precious plant of some kind, I went in and looked at it more closely. Imagine my disgust to discover so carefully protected from pests, that meanest of all mean shrubs, the *Phyllanthus nivosus* var. *roseo-pictus*, whose variegated washed-out pink and white foliage, in company with other weird and grotesque variegated plants "adorn" so many dooryards of the tropics generally. What there is in variegated plants that attracts people, I do not understand. I wonder if the first house plant which prehistoric woman nursed in the corner of the tribal cave was some striped, abnormal, diseased-looking croton or pandanus or agave.

We left the beautiful island of Fernando Po with keen regrets at not seeing more of it. Sir Richard Burton of Arabian fame was once consul here and it was here that the botanist Vogel died. The same evening, in going out of the harbor, we passed the barrage of sunken boats which the Germans had laid down across the estuary of the Cameroon, the only signs we saw of one of the most bitterly contested and ghastly campaigns of the Great War, a campaign in which the men were not only fighting each other, but the diseases and privations peculiar to tropical countries as well.

We were soon anchored off the low-lying town of Duala with tropical costal vegetation on all sides, but we were so far out in the estuary that we could see little but the haze hanging along the shore. The Cameroon dugouts, each with its skilled stern oarsmen sitting far back on the very point of the canoe in order to handle the craft better in the swift currents that come and go in this stream, soon gathered about the yacht with tropical fruits. To my surprise they offered large, and fine-flavored avocados. This fruit is a strictly American species and must have been brought over to West Africa, but the fact that it is seen in abundance only in the Cameroon speaks for a later introduction than the date of the bringing in of the yam and the cassava which have long since become the greatest staple foods of all West Africa. Like North America, West Africa is largely dependent upon introduced species of fruits and vegetables. Aside from the wild oil palms, which the natives have done little with in the way of selection or improvement through the centuries of their occupation of the region, and the sorghums and millets of which they have developed few more or less pure strains, I could discover no other staple native food plant. When their agricultural performance is compared with that of the Indians of the West Indies, Peru and Central America, one might, without injustice, conclude that they are either a far younger product of evolution or one with a less definite tendency toward a civilization based on the cultivation of the ground.

As the French Port Doctor came on board I noticed that his hand was bandaged and asked him what had happened to it. "I had an encounter with a boa constrictor," was the reply. Then he explained that in stepping out into the backyard of the hospital one day he had seen a large snake in one of the trees. He attacked it with a stick, as is the general instinct of every son of Adam, and the beast had turned on him, and before he knew it, had thrown two powerful coils around his waist and was crushing the life out of him, at the same time fastening its sharp recurved teeth in his hand. Luckily some natives with their bush knives were near by and came to his relief and cut him free. "I never felt such pain as the squeezing of those coils gave me, even after the natives had cut off the beast's head. It was thirteen feet long and as big around as my leg."

In my early childhood there hung in my father's study a photograph of the famous statue of the Laocoön. It haunted my child life, but in later years I began to believe it was a fable, and I certainly never expected to meet anyone who would prove first hand that it was not.

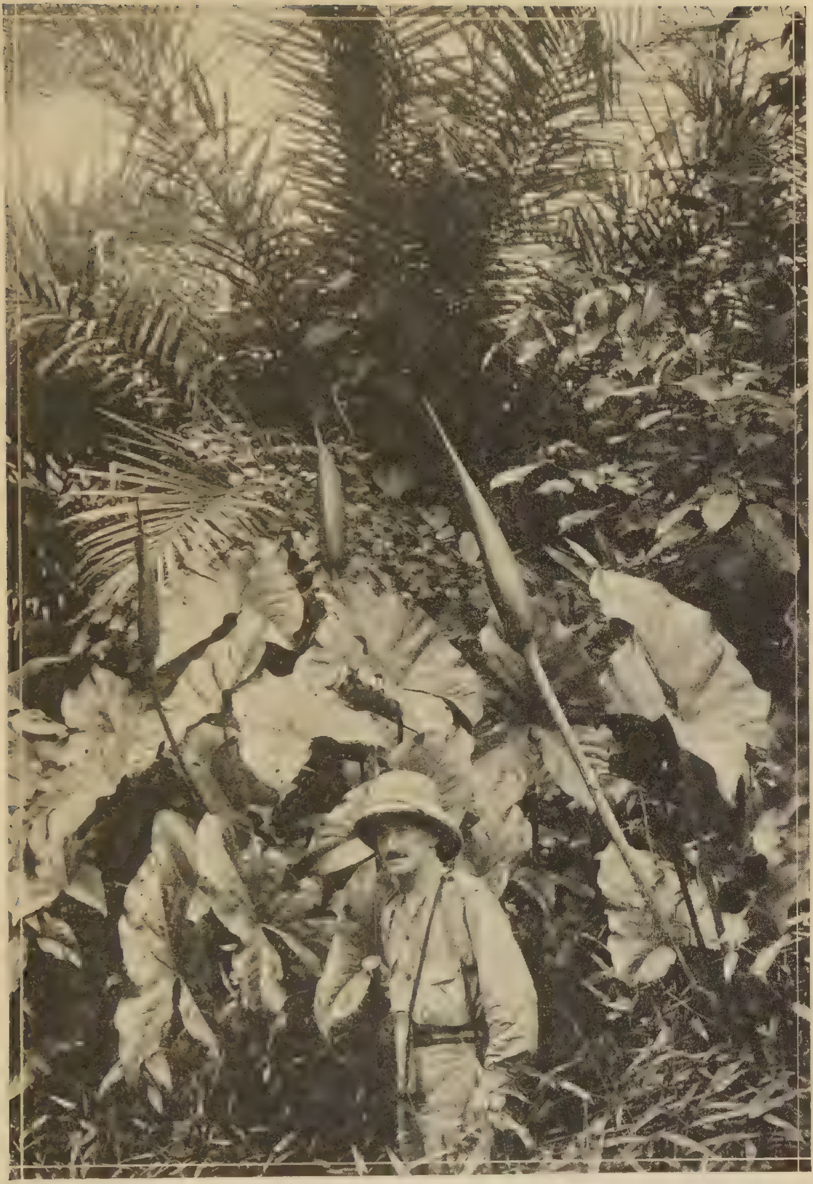
Our first excursion on land soon convinced us that we were in the real rain forest of tropical Africa where fifteen feet of rain falls annually and where the great wild animals of Africa abound, the gorilla, the elephant, and the boa constrictor. It was the dry season, but one would never have suspected it, for everything was wet and the virgin forest back of the town was a tangled mass of aroid palms, lianas and ferns, and plants related to the ginger of commerce. We penetrated into one of these coastal swampy areas where it is so dark that a two-minute exposure of my camera with an F8 stop was barely enough to affect the film satisfactorily. To travel day after day through such jungles as these requires iron nerves and an objective of more than usual importance, and when I think of the botanists who in the past have done so, many of them dying alone in some neglected corner of this great region, I cannot refrain from putting them on the pedestals where they belong as true heroes in the search for knowledge. I thought of the Swiss botanist, Lederman, beside whom I had worked in Geneva, who at one time spent months in this very region and whose hundreds of dried specimens are stored away with the collections of other self-sacrificing men in the Conservatoire Botanique at Geneva, and who was keen to plunge again into such wildernesses.

CHAPTER XXXIX

THE CAMEROON

Before the war the Cameroon belonged to Germany, but in the Treaty of Versailles the territory was mandated in part to the French and in part to the British. When one thinks of it as a territory with a coast line 125 miles long and a back country reaching to Lake Chad a thousand miles away, one is impressed by its size, but when one reads that there were only 1388 male Germans and 177 German women and children in the region, of whom only 172 were planters, and compares the catastrophe of its change of political ownership with the shutting down of a single coal mine, one must begin to realize that it is largely the so-called "Political Importance" that has stirred the public, a public ignorant of the tropics and particularly ignorant of West Africa. But I must not tread on this ground of indeterminables.

Back of the town of Duala with its little hotel and clubhouse and open square of grass and shade trees, a fair motor road leads to some native villages. Unlike the general run of West African villages where there is little if any show of order, these had neatly trimmed hibiscus hedges around the cleanly swept dooryards, and there was a look of trim tidiness which reminded me more of Java than of West Africa. Though I cannot vouch for the authenticity of the report, we were told that this trend toward neatness was inculcated into the villagers by the German administrators of Duala before the war. Later, in the cacao plantations on Cameroon Mountain I was reminded of these trim village hedges, when I saw how scientifically many of the cacao trees had been pruned. I do not believe that any such practices are to be attributed to native initiative and cleverness.



A giant aroid of the Cameroon (*Cyrtospermum senegalense*) towering well above Dr. Dalziel's head.

One day while Dalziel, McKinney and I were poking around in these native villages, McKinney found his first African specimens of mosaic disease. As the tobacco plants planted in soil from Arlington, Virginia, were growing nicely on the aft hatch, he was of course delighted, for it gave him a chance to isolate a, to him, new mosaic virus and inoculate it into his young tobacco plants where he could preserve and study it. I found it interesting to watch his centrifugal machine, whirling 50,000 revolutions a minute as it separated the densities of these viruses which no miscroscope has yet been able to reveal, and to wonder if perhaps the control of virus diseases might not play the greatest rôle of all in the conquest of the tropics, as it is certain that their dangers are tremendous to cultivated plants and domestic animals, and even to man himself in such epidemics as the flu.

In a low sandy place, on the road to Bassa, through which ran a small stream, we found a patch of the most amazing aroid I have ever seen. It is not so large as the gigantic aroid of Sumatra (*Amorphophallus titanum*) described by Beccari, but it is more graceful, and particularly surprising because it grows in masses. Its flowering spathe is striped green and yellow and a foot long. This is perched like a spearhead on a seven-foot square stalk which has spines on all its corners. Hundreds of these tall shafts rise above the arrow-shaped leaves. The whole swamp was covered with this Cameroon aroid (*Cyrtospermum senegalense,* Schott). I recalled a winter in Berlin when Professor Engler was working up the aroids and the fever of interest in the Cameroon Colonies was at its height. I hope that it has been his good fortune to see for himself this striking species of his favorite group of plants.

The vast back-country of the Cameroon with its plateau rising to 4000 feet and a rainfall which decreases as one gets back from the coast, must still be a fertile collecting field for botanists, although, accustomed as I was to thinking of the Malay Archipelago, where each island has its own flora, it took me some time

The highest point on the West African coast is Cameroon Mountain, which rises 13,500 feet behind the "town" of Victoria.

to realize that a comparatively small number of species are here scattered over many thousands of miles of territory, so that the chances of finding something new to science is not so great as in the islands of a great archipelago.

With no hotel at Duala one is dependent upon the hospitality of others. Indeed, anyone visiting this or any other port along the coast had better arrange for his accommodations before he starts.

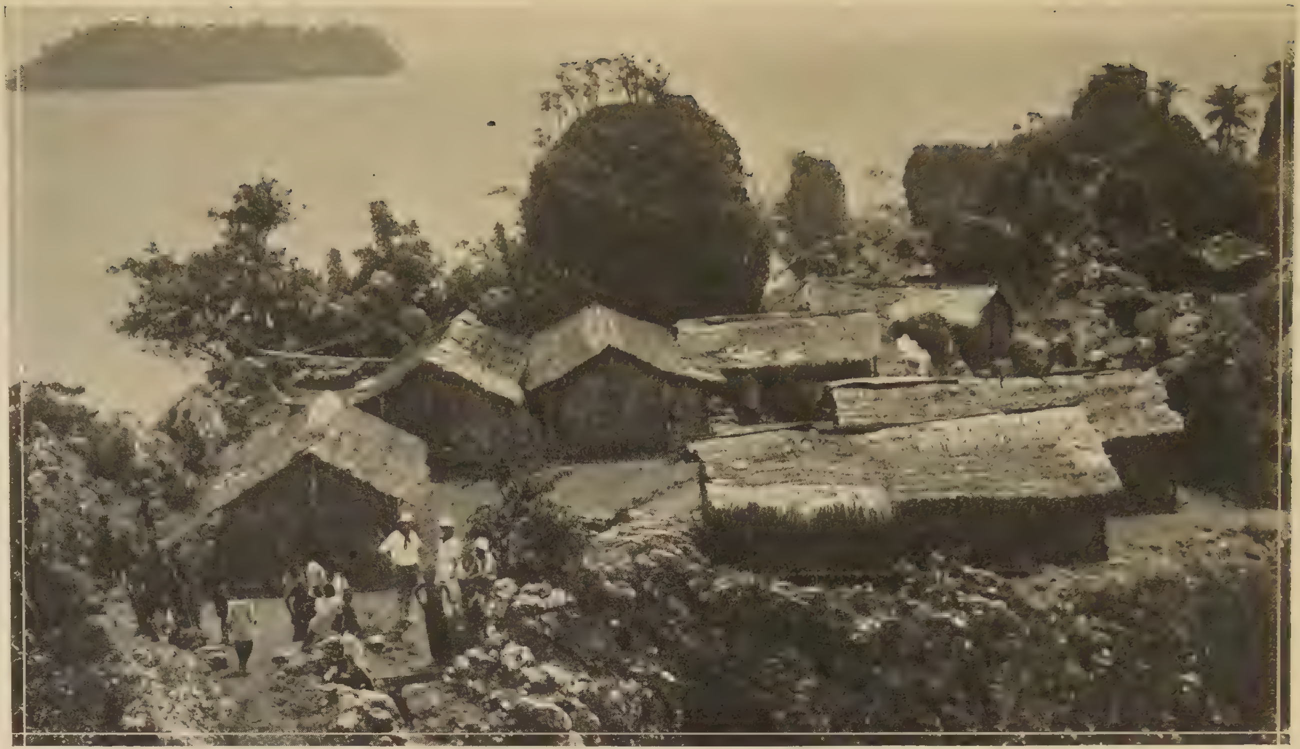
All of our mail was waiting in Victoria, which is just across the line in the Nigerian mandate, and at the base of the highest mountain on the whole west coast of Africa. Every one had pointed to Victoria as the most promising of all places for our collecting work, so we dropped down stream and over to what we had all imagined would be a typical British town.

As we dropped anchor in front of the island where Sir Harry Johnston lived for a time, in sight of the Pirate Islands, which in his day were inhabited by cannibals, the panorama of the Great and the Little Cameroon mountains unfolded itself before us. We knew that we had done well to hurry on. This was assuredly the spot of most interest in all West Africa.

But where was the town? Another illusion of African grandeur was dispelled. We saw a few buildings to our right, which the pilot said composed Victoria, where the Assistant District British Officer lived, while others on the left were Bota where the Germans were again getting their oil factory into shape. The one store was hidden by the trees.

On landing for the mail we found it had not yet come, and we were all wondering where it was, for we had thought Victoria was on the through-steamer routes. We discovered, however, that it was on a branch line, so to speak, visited only by an occasional mail boat. As a matter of fact, so infrequent are the mails that when we left, we carried His Majesty's mail to the Gold Coast with us.

I shall never forget the yacht on that first morning in Cam-



A village on the picturesque Pirate Island off the coast of Cameroon and, in the distance, the island where Sir Harry Johnston lived.

eroon. Everybody was interested. At all of the other ports there had been little to see from the boat, no mountains, no great landscapes which would appeal to those to whom one tree is much like another. Here there was something to look at. Rising 13,350 feet above us in the distance was Cameroon Mountain and while it had nothing of the spectacular beauty of the Pico de Teyde in Teneriffe, not having a distinct peak, yet the clouds which roll under it and cover the dense tropical forest gave it an appearance of extreme height. It does in fact reach to such a height that in the dry season snows gather on its summit. The Little Cameroon Mountain is more of a peak, and although much lower, has never yet been climbed, owing to its steep precipices and dense overgrowth of jungle.

I saw at once that it was going to be warm—hot would be a more correct word to use. And hot it was during most of our stay in the harbor of Victoria, with the exception of the early mornings when it was deliciously cool and delightful in contrast with the stuffy heat of the nights.

How can I describe the experiences of these days full of intense interest, when all sorts of unusual sights and sounds and odors and happenings, all jumbled together, came tumbling upon us! The real trouble was that there were too many things to do and too little time in which to do them, the range of our interests was too great.

Dalziel wanted to climb the mountain and collect the subalpine plants that he knew must be there; McKinney wanted to see if there were not some mosaic diseases in the plantations; Schultz was crazy to visit the cannibals on the Pirate Islands; Mr. and Mrs. Whitehouse were ready to go up the mountain and take a look at the so-called "Putkamers Palace," and Mr. Armour, who had once known Putkamer, the former Governor of the Cameroon, went with them and they spent a delightful afternoon in the palace at Bouea with the British Resident, Hon. L. Buchanan Smith who now occupies it. As for me, I was torn in my interests between the plantations of cacao and oil palms, the wild jungles of the lowlands, and the Botanic Gardens. As it turned out I saw something of all three. There were not enough automobiles for us all, and as usual the "Scientific Johnnies" had right of way, leaving the other guests on the yacht without transportation, unless they walked, which they sometimes did, but as Mrs. Whitehouse once said "it was more like a walk in a Turkish bath than a quiet saunter through a lovely garden." As I look back at the evenings on board in the harbor I can only wonder and admire the Whitehouses' unfailing enthusiasms and patience with us.

We prepared our kits, canvas bags full of oiled paper in which to wrap the fresh plants, small cotton bags in which to put seeds, tags and twine, film packs, tripods, cameras and camera accessories, and my beloved *piosche*, which Mr. Armour had made for me with his own hands. These we piled at the head of the gangway where we generally had to wait for some tardy one to go back for something he had forgotten.

While Mr. Armour was struggling with the Customhouse Official we walked on the gray sandy beach under some tall casuarina trees where were scattered those great sea-beans that are to be found in the bric-a-brac cabinets of America. Few of those who handle their sea-beans ever suspect the poisonous character of the pods from which they come. A single grasp of one of these pods would leave sticking in one's hand thousands of poison-tipped hairs and give one a rash more irritating than an attack of hives.

I had heard much of the *Kamerun Botanischen Garten* through my German acquaintances and naturally we gravitated toward it. Although there had been no trained Director in charge of it since the war and we had heard that a lot of sailors had mixed up the labels out of pure deviltry, we knew that a Botanic Garden takes a long time to go to pieces. This one had had Dr. P. Preuss at its head for a number of years, and he had left behind him a remarkable collection of plants. Judging from the carefully sketched plan which he made in 1898 and which his assistant N. F. Strunk brought down to 1905, it was more like one of our Plant Introduction Gardens than a Botanic Garden, for in place of single specimens, there were blocks of many trees representing, for example, many different varieties of cacao and rubber and timber trees. In fact the garden was called the "Botanical Garden of experimental plantings of the Agricultural Experiment Station in Victoria, Cameroon."

Through a handsome avenue of the strand tree, *Callophyllum inophyllum* which I had never seen used in this way before, we wandered about hunting for the administration buildings. There were charming vistas under great artocarpus trees, and through masses of cluster palms, and we were surprised to find the grass cut and everything in a more or less shipshape condition.

Arriving at the buildings our ears were deafened by the chatter of a thousand weaver birds which had appropriated a ficus tree overhanging one of the sheds. I never have seen such activity, so much saucy back talk, and such quick nest building, for when Mr. Whitehouse came back next day with his pocket movie camera, the nest making was finished and the place was as quiet as if there never had been a building boom.

As no director has been appointed since the war, the responsibility for the conduct of the garden seemed to have fallen on two intelligent natives, Bender who spoke only German, and Mandolin who talked fair English. I was surprised to find how many of the plants in the gardens they knew by the scientific names, and concluded that they must both have been trained by Dr. Preuss or Dr. Weberbauer or their successors. We at once appropriated these two men as guides and they proved to be good ones.

The gardens are beautifully placed on either side of the rushing Limbe River, and we spent several days botanizing and collecting there, Captain Coley, the Resident, having given us carte blanche to take any seeds we wanted.

I had no sooner said that I wanted to see what species of Gar-

A branch of the miraculous tree (*Synsepalum dulcificum*). After eating its fruits everything, even a lemon, tastes sweet.

cinia there were in the gardens than I was brought the fruits of what I take to be the East Indian species, *Garcinia hombroniana.* There were plenty of them and I tried them out thoroughly on the various members of the yacht's company, but am sorry to say there was a taste about the fruit to which none of us became accustomed, and I was reluctantly obliged to relegate this species to the rank of a possible stock on which to graft the mangosteen. Should it turn out to be valuable for this purpose, then perhaps Mr. Whitehouse, who sat patiently all one afternoon cleaning the seeds, may forgive me.

I had once read of the miraculous-fruit and had once even tried to introduce it into America, but when Mandolin showed us four bushes covered with red fruits the size of a small damson and told us they were good to eat, and that they were called the miraculous-fruit, both McKinney and I helped ourselves liberally, without paying much attention to the story of their miraculous power. They were not good enough to become excited over, though not at all bad. Dr. Seller, a chemist connected with the German company at Bota, who had known the Garden in its better days, was with us at the time, telling us something of its history. In the course of the morning we landed at his bungalow and he hospitably offered us a glass of beer to quench the heavy thirst that comes with any exertion in the tropics. As we left, Dalziel and I got into a discussion regarding the relative quality of German and English beers, Dalziel declaring that to him German beers were too sweet. I had not noticed it at the time, but when he mentioned the fact, I was aware that I had never tasted any beer so sweet as that which Dr. Seller had offered us, and McKinney felt the same way. It took us some time to recollect that we had been eating miraculous-fruits and that the effect is to paralyze some of the papillæ of the tongue so that many things, even acid ones, taste sweet for some time after eating them. We at once called for some lemons and sure enough, they tasted as sweet as oranges, or perhaps more like the so-called sweet lime sometimes found in our gardens. I had already gathered a quantity of the fruit for seed, but now I stripped the trees, knowing that there were many hundreds of my curious-minded countrymen in Florida who would love to have the miraculous tree in their gardens. The genus is a West African one of the order Sapotaceæ, and there is only one species in it, *Synsepalum dulcificum.* There are doubtless many things which will play pranks with the papillæ of taste. The miraculous-fruit has taught me one lesson, and that is, not to be too sure that my papillæ are infallible when I taste a new fruit and do not at first like it.

The garden was not particularly rich in African species, but as it made no difference to me where I got my seeds, providing they were new to American Horticulture, we collected everything that was interesting and had the laboratory room on the yacht filled up with material. Among those which interested me particularly were the seeds of a magnificent artocarpus which was labeled *A. falcatus* and which had edible fruits like the other species I had collected in Singapore and Ceylon. Only four of all the seeds I collected from the tree lived to reach America, and I am anxious to see if they will grow into trees in South Florida. Of the stately tree *Erythrina glauca* with glossy leaves and startlingly beautiful deep-orange flowers, unfortunately only one living seed could be secured.

We called on Mr. Ziegler, the German Manager of the Palm Oil Mills and the large Moliwe plantations, and he invited us to visit their plantations on the slopes of Cameroon Mountain. I had not been prepared to find such good roads, much better than those in Sierra Leone or Liberia. The cacao plantations were extremely interesting. Although neglected during the war, they had been bought back by German companies as soon as they were put up for auction after the mandating of the territory to Great Britain, and the trees were now being given a good pruning. I was surprised to see how scientifically this had been done in the past. I was reminded of the appearance of pear orchards in

Belgium or America, though the dense nature of the foliage casts a shade so deep that when under the trees you feel you are in a forest. The whole plantation contains 27,000 hectares, of which 5000 are under cultivation, and aside from the cacao plantings there are 160,000 African oil palms, both wild and cultivated. The oldest plantation appears to date from 1898, and as I walked through it I could not help realizing that a comparison of conditions here with those on the lowlands of Sumatra, for the culture of the oil palm, would be in favor of Sumatra with its great reservoir of Javanese labor.

As the British Resident, Mr. Buchanan Smith, had sent us an invitation through Mr. Armour to spend a couple of days at Bouea, Dalziel, McKinney and I gladly accepted. Bouea lies on the slopes of Cameroon Mountain and we could make a trip from there to Moyuco which would give us a chance to see the real jungle of the Cameroon.

The setting of the so-called "Putkamer Palace" which was built by the German Governor at great expense and probably some extravagance, is superb. From its terraces and beautiful gardens filled with roses, one can see for many miles across the valley, while behind it rise the great slopes of Cameroon Mountain. It is equipped as any wealthy gentleman might equip a country place in Germany, with comfortable parlors and halls and elaborate bathrooms.

I found the gardens interesting because of the number of introduced trees in them. One could see that they had been in charge of a trained man who knew tropical plants. There were avenues of avocados as well as of mangos. According to tradition the avocado was introduced into Cameroon not over forty years ago by a man named Alfred Saker, a German missionary who brought in and established about his mission the breadfruit, the pomegranate, the mammee apple, the mango and the avocado. As a result one sees the breadfruit quite often, exceptionally fine specimens being grown at Duala, in fact to most of those on the yacht the Duala trees furnished the first breadfruit they had ever eaten. The mango is abundant and the avocado, too, seems to have been planted by the natives everywhere along the roadsides and in their yards. It is interesting to compare the rapidity with which the black man of Africa has taken up new fruits and vegetables, with the slowness with which the French or Spanish or even British have adopted them. Forty years is not a long time in the introduction of a new fruit, yet here there were avocados everywhere. They were all of one type, the West Indian, and of medium size and of fair, though not first-class quality.

The Resident was much interested in still further beautifying his gardens, although rose hedges everywhere and avenues of *Cupressus wightiana* and tall handsome araucarias made it already a most attractive place. He wanted to know what mountain plants he could get that would bloom in the winter. Just before leaving Kandy I had met, by chance, a plant breeder, who at his place in the mountains near Newara Eliya was breeding the Jameson or Barberton Daisy of South Africa (*Gerbera Jamesonii*), so I wrote asking him to send Mr. Buchanan Smith some of his seed.

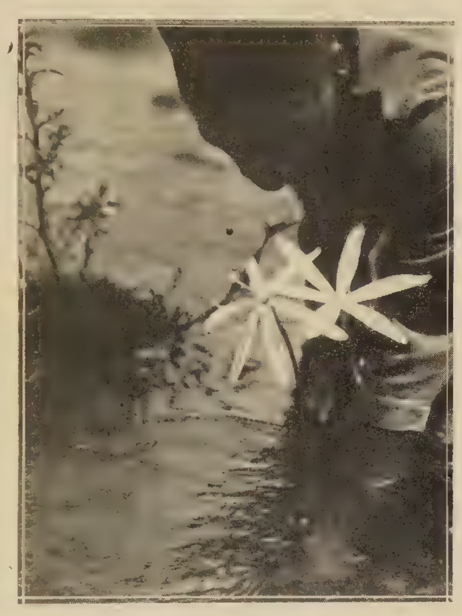
It is very hard to give anyone who has never been in the tropics an idea of our drive to Moyuco over a road which took us through as fine a virgin forest as any to be seen in Panama or Sumatra. To those who know the great redwoods on the highway to Grant's Pass in Oregon I might say these virgin forest trees compared with them, only everything is diminutive in contrast with those giants and the tangle of vines that tumble from the tree tops is more dense than the growth under the redwoods, but there is the same kind of awful stillness and one is overawed in the same way. We found many interesting botanical specimens that were of particular interest to Dr. Dalziel, and Dr. McKinney discovered a legume which looked as if it might have distinct possibilities, as well as several species of ficus, though nothing, I fear, that is of much value. Perhaps our most interesting find was a superbly marked camelion which we brought aboard the yacht. Mrs.

Whitehouse named it William, until one morning it was discovered laying eggs and she was obliged to feminize its name. It died soon afterward, unable to stand the disgrace.

As we were sitting at lunch under some cacao trees that lined the roadway I observed a beautiful, brilliantly colored fly biting McKinney's cheek. I killed it and bottled it and when I showed it to Dalziel he pronounced it the carrier of the parasitic worm, the Loa Loa, that causes the so-called Calabar swellings. Sir Patrick Manson's treatise on Tropical Medicine deals at length with this parasite. It is an amazing one, for it may wander about in the muscles of its human host, into which it has slipped from the mouth of the fly, for as long as ten years without causing any symptoms whatever, then suddenly a swelling as large as a walnut will appear, give the person a bad week of irritation and discomfort and disappear for an indefinite time to come again somewhere else on the body. It was identified as a small worm, less than half an inch long, by the discovery that when one of those swellings occurred near the eye, the worm could sometimes be seen crossing the cornea of the eyeball. Later when we arrived on the Gold Coast we met a Medical Officer at Winneba, Dr. Oakley, who had taken out these worms from patients' eyes, one of them quite recently, and he gave me one of his specimens which I presented in his name to Dr. Wilmer of Johns Hopkins. I hope I killed the fly before any worm had had a chance to enter McKinney's blood stream.

Crossing a stream near Moyuco where the current was swift though not deep, we saw the remarkable African *Crinum natans*. Nothing was visible except the great white flowers six inches across, rising on stout stems a foot or so out of the water. I tried to get some of the roots but this was the wrong season to pull up bulbs and we had no boat, so we only succeeded in getting a photograph of one. There are rivers in South Florida that might be made very beautiful with this crinum, and I have regretted ever since that I failed to get it.

Returning from Moyuco we passed through plantations of the funtumia rubber tree which have been practically abandoned since the Brazilian hevea has shown itself so far superior to it in the amount of latex it gives. It was a stern reminder of those days of the great search for the best rubber tree when, without sufficient scientific information, great rubber plantations of castilla were established in Central America and of *Ficus elastica* in Java and of this funtumia in West Africa. The present scientific search for other rubber-producing plants being so assiduously carried on by O. F. Cook for the Department of Agriculture has behind it the failures of the past and a very wide knowledge of plant species, and should make those people pause who are too sure that we have already in cultivation the only successful rubber plant. I could not help thinking of this when Mr. Edison and Mr. Firestone were looking at the hybrid cryptostegia plants in our garden at Chapman Field below Miami last year, and Mr. Edison, who was fingering a piece of sheet para rubber just sent in from Haiti, said to Mr. Firestone, "You don't need so much elasticity as that," pulling out the sheet as far as its elasticity would permit. "All you need is this," and he stretched the rubber an inch or so.



Crinum natans, a giant species which blooms in the running water of the rivers of the Cameroon.

One of the objects in coming up to Bouea was to enable Dr.

Dalziel to perfect his arrangements to climb the mountain, as it requires a guide who has a thorough knowledge of the trail, several carriers, and most of all, warm clothes to protect both the explorers and the thinly clad natives from cold, as they always suffer keenly in going up to high altitudes. Schultz was to go with him, as McKinney felt sure there were not likely to be many mosaic diseases at such high altitudes, while I preferred to spend what little time was at our disposal in the lower, botanically richer altitudes.

We bid our charming host adieu and started down the mountain in his car. We had just passed a remarkable silk cotton-tree completely covered with epiphytes when there flashed into sight a splash of scarlet against the deep green foliage. It proved to be a plant I had been very anxious to see, *Mussænda erythrophylla.* The liana or creeper had made its way to the top of a tall forest tree, and there, just as the English ivy often does, it had sent off a number of branches a yard or more long, at right angles to the tree, and at the tips of these branches, as also of the short side branches, there were flower clusters surrounded by what at first one would think to be large bracts of a deep and wonderful scarlet hue. The whole setting and style of the plant quite set me crazy to possess it for the pergolas of Panama, Cuba, Porto Rico and especially of South Florida if it would grow there. But how were we to get it? The forest tree was completely surrounded by a dense growth of a species of amomum ten or twelve feet high and the only way to get to the base of the tree was by tunneling through the solid masses of the stems of this great relative of the ginger. McKinney went through in one direction and I crawled through in the other and we met at the tree, but were then little nearer to our prize, for the tree trunk was simply covered with a mass of vines. We pulled and tugged at them but to no avail and we had no idea whether what we were pulling at had anything to do with the flowers we wanted or not. Finally after some rather exhausting work we unraveled the various vines and got the Mussænda down without completely ruining its delicate flowers. There were no seeds; of course, that was to be expected, for had the plant been in seed we should not have noticed it. Familiar with the fact that cuttings of vines taken where they are lying on the ground generally root easily, we took a number of cuttings and laboriously dragged them back through the amomum thicket to the road. The flower itself was a pretty little thing, with blue and yellow corolla, and there were clusters of these packed together. The scarlet part was perhaps two inches across, leaf-shaped and not a bract at all, but an enlarged sepal. A number of these scarlet sepals around each flower cluster give the vine its gorgeous effect. I had seen Mussændas before, in fact in Ceylon a scarlet one is in cultivation which is not a vine but a bush. I suspect there is some systematic work necessary on the group, for the great liana of Cameroon seems to have little resemblance to the form I saw in Ceylon, though it is given the same name. There is another genus of plants in which the sepals are expanded out into the show organ of the flower cluster. Howard Dorsett and I once found it on the shores of Gatun Lake, Panama, and sent seeds of it to the Botanic Gardens of the tropics but I think its name, *Warszewiczia,* must have killed it. Both of these widely separated scarlet-flowered plants belong to the immense order *Rubiaceæ*, with its 5500 species, which is one of the largest of the orders of flowering plants.

McKinney and I nursed those precious cuttings in one of the wardian cases on the yacht and at least one of them lived to reach America.

On reaching the Utowana we were delighted to find there Mr. M. A. Cheek, the pioneer rubber expert who started the Firestone Plantations in Liberia and whom we had expected to see there but missed. He was studying the whole situation along the coast and came over from Duala pretty well tired out from the hardships he had endured and the poor food on which he had been obliged to subsist. When Mr. Armour invited him to stay aboard, the luxurious and perfectly appointed yacht must have seemed a veritable bit of Paradise to Cheek, after his hard months of travel, and he fitted into the friendly circle as though he had always been there.

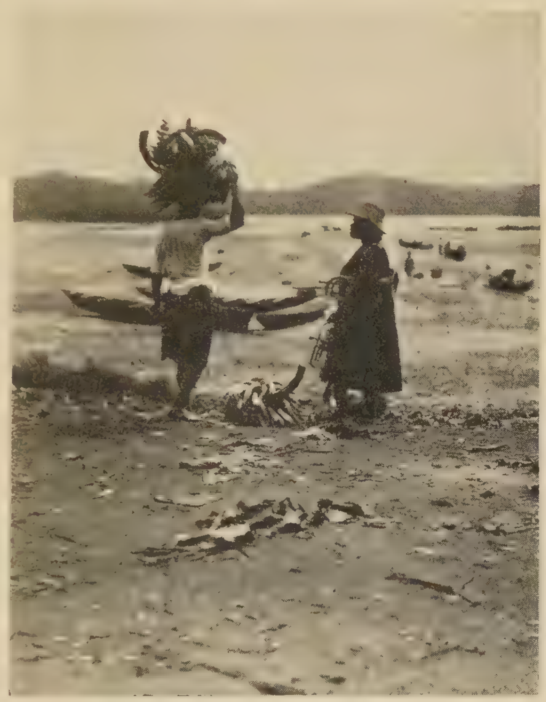
Mr. Cheek had spent his youth in Siam where his father, an American ex-medical missionary, had become owner of a large herd of elephants and gone into the teak business from which he was later driven out by the Siamese. By a curious coincidence this Cheek Case was giving our Minister, John Barrett, much concern just at the time when Mr. Lathrop and I arrived in Siam in 1896, and he got Mr. Lathrop to help him concoct a cablegram to the Associated Press. I had supposed that the heirs were recompensed, but Mr. Cheek told me that they had never received a cent.

As he wanted to visit the German plantations in the interior, he and I joined forces the next day after seeing Dalziel and Schultz off on their strenuous trip up the mountain.

The largest market in Cameroon was said to be that at Tico, for there the natives come in from Nigeria, across the border, in their great dugouts with loads of foodstuffs, and I wanted to see what these contained. As we drove through the cacao plantations, every once in a while we passed a Hevea rubber tree around which invariably were to be found hundreds of vigorous seedlings, some of them as high as one's head. There can be no question that the tree is perfectly at home on the African coast and I gathered that the success of the Firestone experiment will depend as much on the wisdom shown by the Home Office in Akron as it will on the circumstances to be met in Liberia. Everything depends on the management. As yet there had been no attempt made at seed selection or any form of asexual propagation of the rubber tree. Neither here nor in Sumatra or Java, for example, did we find that anyone had tried the simple method which had at once occurred to

Mr. Dorsett, of growing the tree from root cuttings. It surely must have been tried.

The market was closing as we arrived at Tico. The tide had gone out and left scores of great dugouts stranded in the muddy ooze and their owners were shoving them a quarter of a mile down to the water, making streaks through the mud like those which giant clams might make. A strong smell of decaying vegetation rose from the mud. Silhouetted against this background I observed a large black woman in the usual Mother Hubbard of calico, with a pith helmet on her head and two brass horns under her arm. She was talking vigorously to a tall darky with a bunch of bananas on his head. Cheek, who understood the language, overheard her conversation and said to me afterward, "She was trying to get the fellow to desert his wife and come with her."



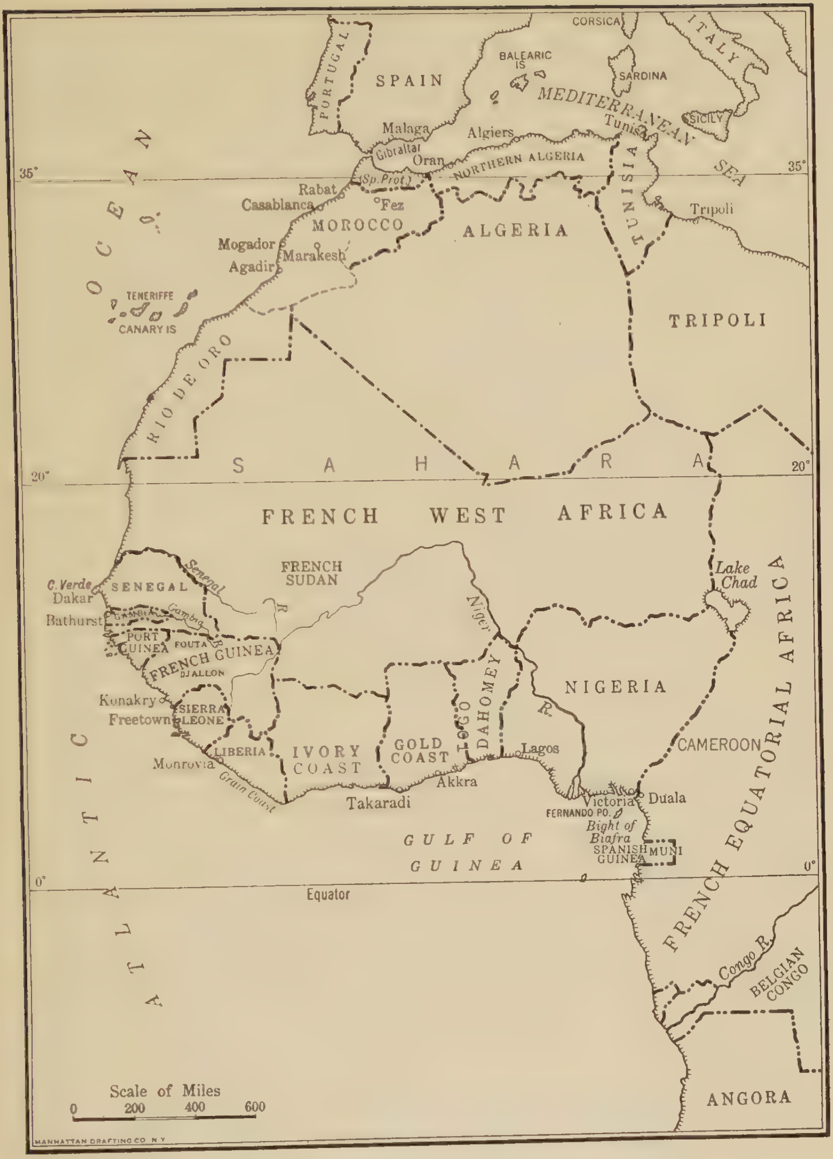
The eternal feminine leads them on, even in the Cameroon. A musician and her lover on the shore.

The only interesting thing in the market was some tropical corn, which I thought, because of its long covering husk, might be resistant to the corn worm that is such a pest in most tropical countries. The husks were brown and looked scorched and I learned that they are purposely dried over a fire to kill the insects and make the corn keep better.

At the village of Likomba we found the headquarters of the Guatemala Company and were shown the banana-drying kilns which since the war have begun to get back into production. The banana is peeled and then stuck on sharpened nails and dried whole in what seemed to me a rather crude way, but the product, I was told, meets with a ready sale in Hamburg. As there has been a good deal of talk about the possibilities of banana growing on the Coast, I was glad to meet Mr. Richter, the Hamburg Representative of the African Fruit Company whose original promoter, Mr. Soskin, had once been brought into my office in Washington by that remarkable Palestine Zionist and botanist, Aaron Aaronsohn.

Mr. Richter took Mr. Cheek and me through his company's plantation of 1500 acres. There is an additional 5000 acres in prospect, and he told us of the proposed putting on of an eighteen-day steamer from Hamburg to Tico, where a pier has already been built. It was interesting to hear the discussion between Cheek the American and Richter the German, as to the possibilities of developing a better steamboat service up and down the West African Coast, and as to where the freight was coming from to support it.

Another day as Bender and I were driving toward the Mokundange oil palm plantation, he began to beg me to take him to America, a habit many Africans have, for they believe America is a kind of paradise. I told him that he would freeze to death in the snow which was sometimes three feet deep, but he declared he knew what snow was for he had seen it on Cameroon Mountain and was not afraid of it. I tried to visualize Bender in a cotton plantation in Georgia, for example, for he was far above the average in intelligence, having learned a hundred scientific names at least. I asked him what he would do with his wife and


CORSICA
ITALY
PORTUGAL
SPAIN
BALEARIC IS
SARDINA
MEDITERRANEAN SEA
SICILY
Malaga
Gibraltar
Algiers
Tunis
Oran
NORTHERN ALGERIA
TUNISIA
35°
(Sp. Prot.)
Rabat
Casablanca
Fez
MOROCCO
ALGERIA
Tripoli
Mogador
Marakesh
Agadir
OCEAN
TENERIFFE
CANARY IS
TRIPOLI
RIO DE ORO
SAHARA
20°
FRENCH WEST AFRICA
FRENCH SUDAN
Senegal
C. Verde
Dakar
SENEGAL
Gambia
Bathurst
PORT GUINEA
FOUTA
FRENCH GUINEA
DJALLON
Niger
Lake Chad
NIGERIA
TOGO
DAHOMEY
Kunakry
Freetown
SIERRA LEONE
LIBERIA
Monrovia
Grain Coast
IVORY COAST
GOLD COAST
Lagos
Akkra
Takaradi
CAMEROON
Victoria
Duala
FERNANDO PO.
Bight of Biafra
SPANISH GUINEA
MUNI
GULF OF GUINEA
ATLANTIC
0°
Equator
FRENCH EQUATORIAL AFRICA
Congo R.
BELGIAN CONGO
ANGORA
Scale of Miles
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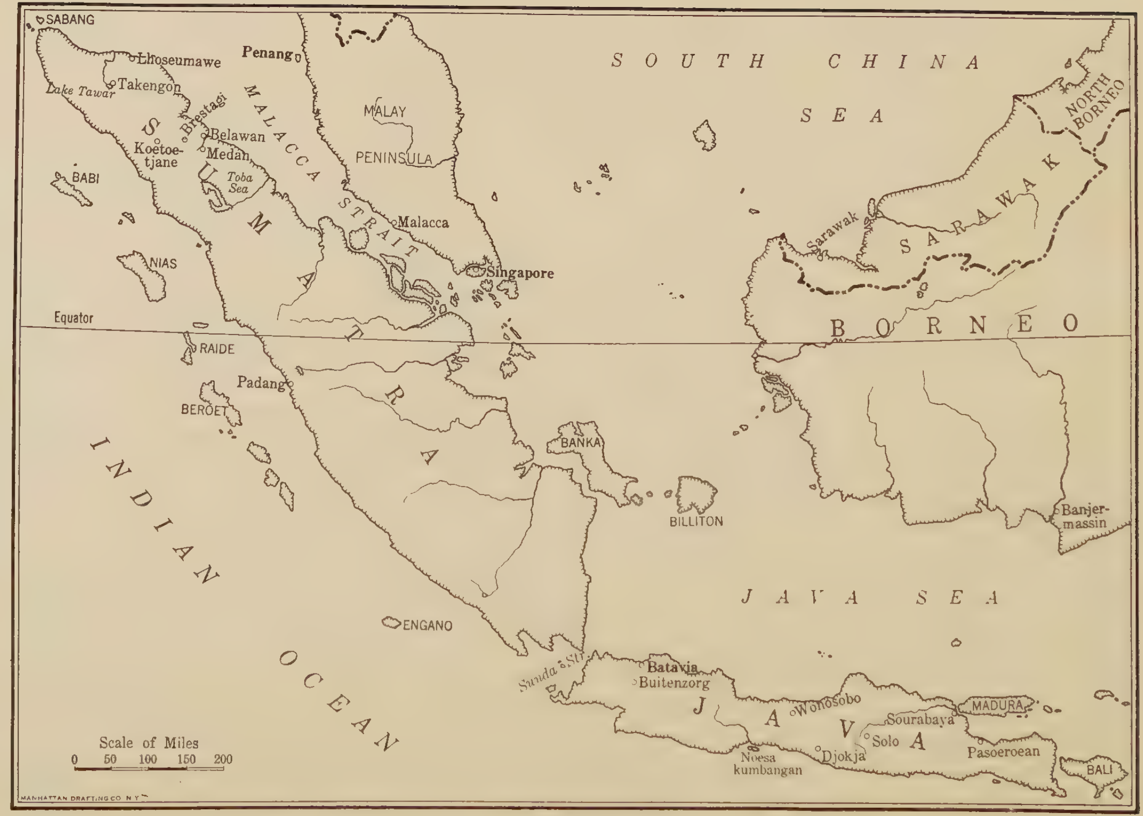
400
600
MANHATTAN DRAFTING CO. N.Y.

Part of North and West Africa, showing regions visited on the expeditions of 1925 and 1927.



SABANG
Lhoseumawe
Penang
Takengon
Lake Tawar
Brestagi
Belawan
Medan
Koetoe-tjane
Toba Sea
BABI
NIAS
S U M A T R A
MALACCA STRAIT
MALAY PENINSULA
Malacca
Singapore
Equator
RAIDE
Padang
BEROET
BANKA
BILLITON
ENGANO
INDIAN OCEAN
SOUTH CHINA SEA
SARAWAK
Sarawak
NORTH BORNEO
BORNEO
Banjer-massin
JAVA SEA
Sunda Str.
Batavia
Buitenzorg
JAVA
Wonosobo
Noesa kumbangan
Djokja
Solo
Sourabaya
MADURA
Pasoeroean
BALI
Scale of Miles
0 50 100 150 200
MANHATTAN DRAFTING CO. N.Y.

The Western Malay Archipelago and the Malay Peninsula. Visited 1926.

children. "Leave them behind," he said. As he spoke, we passed a group of women and children carrying baskets of taros and cassava along the road and as the light happened to be just right for a picture of them I stopped the car and got out. "Oh," said Bender, "there they are now," and by the way the women greeted him I saw he was the head of that family. I do not think that had he emigrated to America anyone would have been able in a few years' time to distinguish Bender and his family from any one of the more intelligent families of Negroes of Georgia.

In the little village of Bobendi, Bender stopped to show me a shrub, whose leafy branches the villagers use to kill the fish in the streams. It turned out to be a leguminous plant (*Tephrosia vogelii*) and appears to be of unusual interest since its leaves contain a little known alkaloid which it is thought may prove of value in the preparation of insecticides. The natives dam up a stream and into the still water behind the dam they throw masses of the pounded-up green stems and leaves of this plant, and in a short time the stupefied fishes float to the top, and the men can wade in and pick them up. Bender declared that the men felt a kind of deadness in their legs after wading in this poisoned water. The fish are eaten with impunity. We collected all the seed we could find and a year later I had the pleasure of seeing some fine bushes of it growing at our Plant Introduction Garden in South Florida. Almost the first day after my arrival in Washington a prominent entomologist, in discussing the needs of an insecticide which would be powerful enough to kill the codling moth, mentioned the fact that he would like very much to get some of the alkaloid known to occur in the Tephrosias, to experiment with. The seeds we collected will, I hope, enable him to try this next year.

The Mokundange oil palm plantation interested me particularly, for it was made up of several varieties, as was evident by a look at the different kinds of fruit clusters that the gatherers were laying in a row on the ground. They were growing the "Lisombe" and the "Diwakawaka" as well as the common variety, but fruits of only the common variety and the lisombe were in evidence. I thought the common looked the best from a casual examination, but as soon as I followed Bender's example and ate them, I at once saw the difference. The more I tasted the lisombe the more I liked it. There was a nutty flavor about the golden yellow pulp which reminded me somewhat of an avocado. Its yellow oil stained my fingers and lips but I kept on, and I was able to appreciate the remark of Mr. Cheek that when he was in the bush he found he could satisfy his hunger very well indeed with oil palm fruits.

One of the largest plantations in the Cameroon of the West African oil palm.

I had seen a few of the diwakawaka, but I wanted to see a whole head of this remarkable variety, so in the afternoon I got Mandolin to show me a diwakawaka tree in the Garden, and as there was a fruit cluster ripe he let me have it to take on board the yacht to photograph. He then told me that there was a "seedless" lisombe in a plantation in the Ekrona Estate that the natives were particularly fond of, so we motored up to see it. Unfortunately there were no ripe fruit clusters. The only thing I could find was a very weak little plant growing from a diminutive apology for a seed which Mandolin declared was like the "seeds" that are commonly contained in the fruit of this so-called Seedless Oil Palm. I tried to get this seedling back to America but it died on the yacht. He took me to another tree some distance away and he declared that these two were the only "seedless" oil palms he knew of among the 50,000 palm trees which composed the different plantations. This "seedless" palm is, I suppose, a mutation, and in order to establish a "seedless" race one would need to self-fertilize the flowers or at least cross two "seedless" specimens. Probably the insignificant seeds they contain do not reproduce the character of "seedlessness," as, after half a century at least, during which the natives have singled out these two trees, there are no young "seedless" ones anywhere.

I found when I examined the various varieties of oil palm fruits I had collected that, while the lisombe was by far the best to eat, the diwakkawakka appeared to contain the most oil, because of the fact that around each individual fruit in the great cluster there were a number of aborted seedless carpels full of oil.[1] We took every precaution we could think of in packing these various seeds. Mr. Whitehouse spent hours carefully scraping the pulp off each individual seed, and even now when I say "Lisombe" or "Diwakkawakka" he instinctively looks down at his fingers to see if he got all the yellow dye off. A very fair proportion of the seeds arrived in good condition and I attribute this to the care with which every particle of the oily fermentable pulp was removed so that there was nothing on them to encourage the growth of molds.

We had some merry parties in the little laboratory, where we had sometimes several dozen different kinds of seeds drying or being cleaned or packed at the same time. The drier that Mr. Armour made, with screen trays and an electric fan to blow a constant stream of air over them, facilitated the quick drying at low temperatures which has come to be recognized as the very best method in the drying of most shortlived seeds that will bear drying out at all. The Captain and Mate, and some of the more interested of the crew, used to come in during our rush hours and helped amazingly with the cleaning of the larger quantities. Dalziel had his hands full with his own herbarium materials and identification work.

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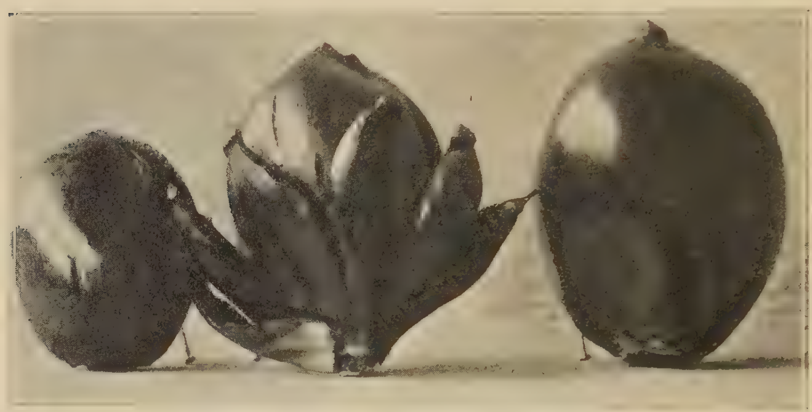
[1] This is, I believe, the *Elæis guineensis,* var. *Poissonii* of August Chevalier. The common type corresponds to the "Congo" of Yamkolsky in A. V. R. O. S. bulletin.



Fruits of the three varieties of West African oil palm recognized in the Cameroon. The "Lisombe" (left), which has the best flavored fruit flesh and is preferred for eating raw; the "Diwakkawakka" (center), with its encircling row of aborted carpels filled with oil which make it a great oil yielder; "Congo" (right), a poor yielder with little oil-producing fruit flesh.

The mountain climbers came back loaded down with high altitude plants, heaths and grasses, a Pennisetum from above timber line, *Adenocarpus Manii*, and a promising looking leguminous shrub to test as a cover crop, just the kind of plants one would expect to grow at 13,000 feet. It had been pretty cold, but Dalziel and Schultz had stood the conditions better than the natives. Dr. Dalziel had seen what he wanted to of the highest point of land on the West African coast, a region which has certain affinities with the highlands of Abyssinia. To one studying the distribution of plants, isolated mountain peaks are, like islands, particularly fascinating because of the new species they are likely to have and because of the light that their floras shed on the distribution of plants during the great Ice Age.

While the collectors had been busy with their plants, Mr. Armour and the Whitehouses had become acquainted with all the different factors of the rather complicated society on shore, the British officials and the German plantation managers who seem to lead a very amicable existence side by side in the two settlements.

Prof. Ziegler had invited us all to a "Palm Oil Chop" at his house and we were keen to get some idea of this famous native dish. It is a remarkable affair, nearly comparable to the rijstaafel of Java, with rice as the base, but with a most glorious golden-yellow curry sauce made with perfectly fresh oil pressed from the lisombe palm fruits. In addition to the color, the oil gave a nutty flavor which I found delicious, and if they ever discover a way to preserve this fresh oil and ship it, as olive oil is shipped, I shall order a case of it at once. At present the oil of the West African oil palm is used for soap manufacture and for the tin plate industry, but the increasing demand for oleomargarine will no doubt result in the discovery of methods of utilizing this valuable oil in the preparation of foods, and the shortage of animal fats will probably never again be a factor so vital as it was in the years of the war. That the world will hear much more from this remarkable palm is certain, and the diwakkawakka may some day be the prevailing commercial variety grown in both hemispheres.

Our days in Victoria could not be many. It was one thing for the collecting crowd to spend all day on shore and come back to the comfortable boat at night, and quite another to stew out there on the water, as the balance of the ship's company did, waiting for us. The nights were hot enough to keep the fans running, and the crew was beginning to get restive with nothing whatever to do except complain to each other about the weather. The little laboratory was filled with seeds of all kinds, and the library books, at least the heaviest ones, were holding down herbarium specimens. McKinney kept his centrifugal apparatus going to extract his plant mosaic viruses, and Schultz's films were hanging up to dry everywhere in our cabins. In fact those were exciting days and nights with so many fascinatingly interesting things to see and so many seeds to clean and plants to identify. There were not hours enough, and I was reminded of exciting times in Panama with Wheeler.

It was hard to say adieu to Cameroon Mountain and the friends on shore who had kept us supplied with papayas and avocados and great delicious star-apples, curiously enough all of them plants of West Indian origin, and when we passed the beaches with their background of dense jungles and realized that we had not seen the elephants which tear the native villages to pieces, nor the gorilla, which is still a rare visitor in these forests, to say nothing of hundreds of wonderful plant forms, we were conscious of a great regret at having to leave.

CHAPTER XL

THE GOLD COAST

In planning our African expedition we had naturally expected to visit Lagos, the chief port of the great Colony of Nigeria, but the nearer we got to Lagos the more inadvisable it appeared to Mr. Armour to go there, on account of the danger of being held in quarantine. Dr. Dalziel's account of the conditions on the low, badly drained soils, where the European and native quarters have not been segregated, and the reports of plague and yellow fever there, rather surprised us, for we had heard much of Lagos.

We therefore set our course direct for Accra, the capital of the Gold Coast, arriving there the 24th of February. Accra has an open roadstead where great rollers are impassable to any craft save the surf boats of the Kru boys with their curious paddles shaped like the hand of Fatima. One never tires of watching these superb boatmen who chant their songs in a minor key as they paddle. Every bit of freight and every passenger passes through their hands, so to speak, for when they have paddled you through the great rollers as far up the beach as they dare, they carry you ashore on their backs or in sedan chairs. One cannot but be amazed that so large a place as Accra can have been built up with such primitive landing and shipping facilities, but the difficulties of constructing a mole here are said to be very great indeed.

We had heard that Governor Guggesberger had been building a port at Takarade and that it would be possible for us to make a journey through the interior and meet the yacht there, so as soon as we landed, we began negotiations for this hundred and fifty mile trip, assisted by the friendly Director of Agriculture, Mr. Chas. H. Knowles, and by Mr. L. A. King-Church, Chief of the Forestry Department, an old correspondent of mine whose sister was a friend of Mrs. Fairchild. There being no hotel in Accra it was not possible for all of the yacht's company to stay on shore, but the collecting "Johnnies" were most delightfully quartered with Mr. Knowles and Mr. King-Church.

Although Accra is one of the large towns of the West African Coast, it is hardly such in a temperate-zone sense, since most of the inhabitants are natives. It has, however, a charming European quarter with comfortable and attractive bungalows, each one with its own garden filled with ornamental trees and shrubs. The interest in these trees and shrubs reminded me of South Florida, and I felt more at home than at any other point we had visited.

There has been an Experiment Station at Aburi, some distance up in the hills behind Accra, for over thirty years, so Mr. Knowles and Mr. King-Church took us up there to spend the day. This gave us a chance to see the character of the vegetation of the great coastal plain, though we had not the time to explore it. I believe many valuable shrubs will some day come out of this great savannah region of the Gold Coast and be cultivated in our subtropical gardens.[1]

To my great delight we found beside the road the charming *Monodora tenuifolia*, Benth. I had seen and admired it tremendously in Peradeniya where it was one of their new and rare flowering trees. In the winter or early spring, while still almost leafless, it produces hundreds of large yellow flowers, mottled and spotted with chocolate brown, much as are the blooms of the Florida orchid *Cyrtopodium punctatum*. These hang on long flower stalks in the way that is characteristic of the *Annonaceæ* to which order it belongs. The bush is a rapid grower and might quite probably grow successfully in the gardens of South

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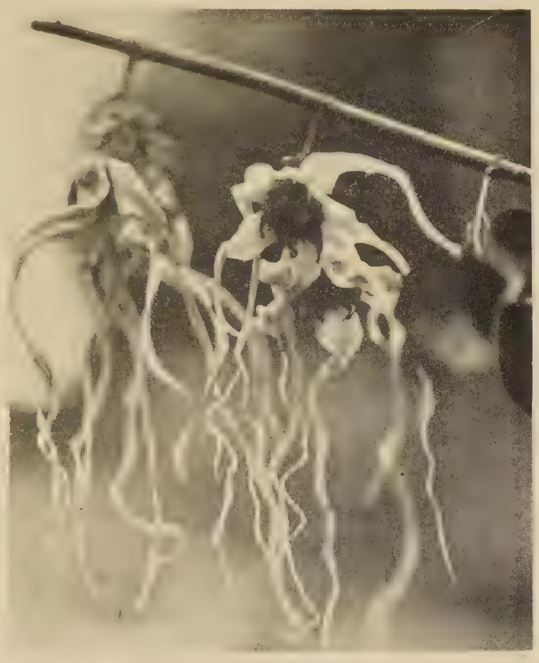
[1] I collected a few seeds of a wild jasmine (*Jasminum dichotomum,* Vahl), growing by the roadside which already shows great promise as a porch vine in Florida. F.P.I. 73067.

Florida. Certainly it should thrive in those of Hawaii and Porto Rico.

Dr. Dalziel had talked a good deal about the flowers of the *Strophanthus*, and just as we were nearing the Station we found a vine in bloom. The large white flowers with streamer-like petals several inches long are very decorative indeed, and there is no doubt that it deserves a place on the pergola in the gardens of amateurs wherever it will grow. The fact that its seeds contain a poison and that decoctions of them furnish an arrow poison, should deter no one from planting it, any more than the poisonous character of the oleander or the crab's eye vine (*Abrus precatorius*) should make people afraid of them.



The strange but showy flowers of the *Strophanthus sarmentosa* with their long pendant petals. If this can be cultivated it will make a remarkable ornamental vine. It is in addition, a drug plant of importance, its seeds furnishing the strophanthin of commerce.

The Aburi Station is well equipped with laboratory facilities for the microscopic and chemical study of all kinds of tropical plant materials, and an invesigation of a rather fundamental character was being made to discover the best method of preventing cacao beans from molding, as the United States Government has been raising serious objections to the condition in which the Gold Coast beans arrive. The question, as I understand it, hinges on the proportion of moldy seeds the experts of the American Government can afford to bar from entry, for as about two-thirds of our cacao comes from this coast, the setting up of too high a standard would shut out such a large proportion of the beans that a serious shortage would be created. That there is a very large amount of decay and that this will have to be remedied is conceded both by the producers and by the American buyers, so the Gold Coast Government is undertaking the problem of finding some method of keeping the beans in better condition.

It must not be forgotten that this great industry of cacao growing is another plant introduction achievement, the cacao having been transplanted from the Western tropics, particularly from Venezuela and Colombia. I was struck with the fact that one sees almost no cacao beans for sale in the market stalls and I was told that the black man is not very fond of them and therefore makes little or no use of them himself.

The most striking tree in the Station Gardens was the *Picralima kleiniana*, Pierre, the seeds of which are said to contain an alkaloid used by the natives of the Gold Coast in place of quinine. Avenues of *Michelia champaca, Cedrella odorata* and the royal palm, gave the place a very attractive appearance, while in the experimental planting stood a fine specimen of the African relative of the star-apple, *Chrysophyllum africanum,* of which I procured all the seeds I could.

The first Brazilian rubber tree to be planted on the West African coast still stands behind the laboratories, its large size and the fact that this was only thirty years ago giving a good indication of the progress of events here.

As Governor Guggesberger happened to be at the time in the Government Country Residence in Aburi, Mr. Knowles was anxious that we call upon him, which we did. The Governor received us very informally and in his manner reminded me somewhat of Gifford Pinchot. His peculiar energy and initiative have won for him an enviable reputation on the Gold Coast, and I was glad to hear him express his views on agriculture. He launched the discussion with the remark that they were going to raise citrus fruits on the Gold Coast and ship them to London.

I hesitated to say that in my opinion the growing of citrus fruits would require more technical ability than the natives of the Gold Coast are likely to acquire and that if the Governor were as familiar as I was with the number of diseases to which the tropical trees are heir, he would hardly be so certain of success in this field. I could not help thinking also of the overproduction in citrus fruits I had so often seen in Florida and California and of the organization of the industry in America to find an outlet for the surplus crop. There are, no doubt, regions on the Gold Coast and elsewhere where good oranges are grown, but once let large groves come into existence and then the microscopic beasts of the jungles will gather to feed on them.

When the Governor heard that Mr. Armour was at Accra with his yacht he at once wired instructions to his aide in Takarade to permit the yacht to enter behind the new mole. "It will be the first boat to anchor in my new harbor," he said. It was a brief interview, but before we left he admonished us to be sure to see his College at Ashimoto, the Prince of Wales College, and just as we were leaving, Lady Guggesberger appeared and jokingly asked if Mr. Armour could not find a place for her as a stowaway on the yacht.

It took a good deal of preparation to get in shape for the trip through the country. There are no hotels and it is quite customary to travel with one's own provisions and bedclothes, in fact everything but bathtubs which, fortunately, are installed in the rest-houses.

The night before we left Mr. King-Church's there arrived in Accra, Dr. Sawyer and Dr. Wolcott, two of the Rockefeller party sent to investigate the so-called "yellow fever" that is believed by some to be endemic on the Gold Coast. They called and later on they overtook us on the road at Doblo Village. After talking with them there still remained a doubt in my mind of the identity of the West African fever with that of the American tropics. I wondered at the time what Noguchi would say to the matter, but I never dreamed that less than a year later he would die in this same town of the fever he was sent to study.

I was amazed to see that in striking contrast to every other white man I had seen in Africa, Dr. Wolcott wore a soft felt hat instead of the conventional pith helmet. In answer to my inquiry regarding this, I received only an evasive word to the effect that he was so hardened to the tropics that more or less sun did not seem to matter.

I shall not forget the leave-taking from Mr. Knowles and the King-Churches. They had been most hospitable and kind during our three days' visit and it was with deep regret that we said good-by to them in the early morning light, and pushed off for the interior.

We took the time to look at Ashimoto College and I for one was a good deal surprised to find so extensive a building program already under way. I could not help wondering if the plan of starting off with a big equipment and a large force of instructors was as likely to succeed as the other plan of growing from a small beginning. It struck me as curious that the architecture should be of a northern style rather than one with larger verandahs and overhanging eaves to give greater shade, but I suppose all architects have a way of having their own ideas accepted. I presume that the training of the hands will form the major part of the education, as it does at Tuskegee, at least I trust so, for there is too often a tendency to give the so-called "higher education" too prominent a place, with the result that there is an overproduction of clerks.

At last we got out on the Accra plain among the wild plants. There is one bad feature about the plain, it is swept in the dry season by grass fires and one has to hunt for plants in the charred stubble, but the low rainfall, last year only eleven inches, the soil conditions which go with lowlands near the coast, and the fact that we were the first to look for species that might be utilized in other lowlands, made the first glimpse of the Accra plain particularly stimulating. Our first stop was to see a large patch of the ground orchid (*Lissochilus heudlotti*) which Mr. King-Church had told us about. The tall flower stalks rose straight from the ground, bearing their attractive purple and white blooms on stems three feet high. When we dug down to see the character of the rhizome from which such a remarkable spike of flowers came, we found hard tubers about the size of a potato. There was an abundance of these tubers and we laid in a stock of them which carried very well to Florida, where they are being tested. If the lime soils there do not inhibit their growth they may find a place in the ornamental horticulture of that state.

In the village of Doblo I found a corncrib which looked for all the world like one that you might see almost anywhere in the South, and the corn seemed to be of the same type that I had seen in the Cameroon. Nothing could exceed the ugliness of these hybrid villages. When the white man introduced corrugated iron to the West African black man he swept away the palm-thatched roofs and gave to the world something that is beyond description, a frame of poles filled in by hand with mud and topped with rusting sheets of the most hideous roofing material man ever invented. When natives say they do not like our civilization, I do not wonder, for what they see of it is incredibly ugly.

In front of such a house I interviewed a couple about their crop of cassava, for when one sees the volume of food material that comes out of a hill of the cassava one ceases to wonder that this West Indian vegetable has spread around the world. In West Africa it might be classed as the most important food plant they have. Yet how few of those who might have fresh cassava in their gardens in our southern states ever take the trouble to grow it.

The plain was fascinating to collect on. The character tree was the same *Elæophorbia drupifera* that I had seen in the Mission yard at Santa Izabel. It is a rather grotesque tree but as we saw it across the plains it was not unattractive, and because of its drouth-resisting qualities it should be given a trial on dry soils elsewhere in the tropics. Around it were grouped many interesting shrubs new to me, and I felt that a collector might find some valuable new forms here for trial on similar soils, if he could only tarry here or be here in the seeding season. The grasses had all been burned and there were no panicles of them to collect.

These living snails, offered for sale at Nsawam on the Gold Coast, were as large as one's fist. They are considered a delicacy by the blacks, whose ancestors were the progenitors of the darkies who taught us how to eat terrapins.

At the native village of Nsawam where we stopped at noon, I saw offered for sale the giant snails to which I have previously made reference in the chapter on Ceylon. They were in a flat basket and very much alive, with their great extensible eyes in continual motion. I had once jokingly proposed to my friend, Charles T. Simpson, when he showed me the shell of an enormous snail from West Africa in his collection, that we organize a company and import them and raise them in the Everglades for the Miami market. Unfortunately he didn't like snails, and he thought there would be enough

The Winneba Plain, like the Everglades of Florida, is dotted with groups of trees and shrubs.

people who would agree with him to make our snail company a doubtful venture!

It should not be thought that snails are anything but a real delicacy on the Gold Coast, for, so Mr. King-Church told me, the right to hunt them cannot be denied to anyone, and every forestry concession must have written into it a clause to this effect.

The market women of Nsawam wear the largest hats in the world, quite twenty-seven inches across, and as they strut around the market are as independent and "flip" as are the well-paid colored cooks of America.

I had never seen the fruits of the velvet tamarind for sale before, but in Nsawam a boy with a face, one-half of which did not fit the other, sold me a basket of them. I shall never forget the expression on Mr. Whitehouse's face when I laid them on his table to clean. I think he was glad to find the majority of them wormy.

Between Accra and Winneba we passed through some coastal forest, but it was thin and stunted in comparison with the great jungles we had been through in the Cameroon. At Winneba we were most royally entertained by the medical officer, Mr. Philip D. Oakley, who, as I have already remarked, presented me with the Loa Loa worm that he had taken from a calabar swelling or rather from the eyeball of a native.

The next day took us through several native villages, in one of which we saw three very interesting trees. They were all growing in the typical hard red clay soil of the village streets, and were evidently principally appreciated for their shade, although they might well have been valued for their beauty, especially the *Homalium dolichophyllum,* with its pale pink flower clusters, reminding me in form, though not in color, of the beautiful *Petræa* vine now common in Florida. The "Eta Dua" (*Phialodiscus unijugatus,* Radlk) if it stands the drouth as well in other places as it seemed to here, might make a first-rate street tree, while the third was a variety of the silk-cotton or true kapok tree that seemed strikingly different from any I had seen before.

While the seeds of these trees were being gathered, I strolled about the village and soon found myself in a great patch of the *Talinum triangulare,* which I had last photographed in Florida, where it has attracted attention as a summer vegetable. It appeared to be a weed here, as I learned from two tall old fellows who came out to see me, dressed very respectably in imitation Javanese sarongs. I could not help being thankful to the Dutch that they had pushed their Amsterdam batiks here on the Gold Coast, as the Oriental designs and colors are vastly more agreeable than the cruder patterns of the so-called Manchester goods.

Two chiefs of the Gold Coast surrounded by a growth of *Talinum triangulare,* a plant which has become a summer vegetable in South Florida.

As we passed through the village of Swedru, I saw a picturesque old loafer under the awning of a place where a woman was selling palm wine, and it occurred to me that my photograph records would be incomplete without a picture of a wine bibber. With a true sense of darky humor he posed and I got the best photograph of my whole collection. I doubt very much if it was the white man who taught the darky to drink.

The forest became denser after we left Swedru and we made numerous side trips into its tangles, finding many wild

Annonaceæ and various leguminous shrubs, in particular a species which formed a thick mat over the roadside bank and seemed to have the characteristics of a good cover crop. As it was not in seed we took a lot of cuttings, planted them in one of the wardian cases and got them to Washington alive.

I had just been wondering if we were not going to see any bamboos along the route, when we ran through a broken mass of bamboo stems which had been torn to pieces by a storm, and I found we were in a low spot where were several large clumps of what the natives call *Krampor.* I examined the culms carefully and made up my mind it was an inferior species, because of the tangled character of its clumps and rather crooked nature of its stems and the evident weakness of its fiber. Later in the afternoon, as the sun was getting low and we were all tired, I saw the waving plumes of some bamboos just off the road and got out to look at them. I had to climb up over a bank to get at them and when I stood on the top of the bank I could scarcely believe my eyes, for I seemed to be looking into a majestic vaulted cathedral with immense fluted columns of bamboo, the ceiling made by the crisscrossing of graceful arching stems. The sunlight filtered in through the leaves as it might through the tall stained-glass windows of a cathedral, and gave to the whole scene a most enchanting appearance. Deep back in the grove the buttressed trunk of a large forest tree gave scale to the bamboos, while the ground under them was perfectly level and free of vegetation and carpeted with the dull yellow of the dead leaves and stems of the bamboo. From the depth of the grove came the sound of chopping, the only sound that broke the curious stillness of the place. It came from a lone woodman who had climbed far up in one of the clumps and was busy felling such canes as he wanted for fence posts and house timbers. I called to the others and together we explored this interesting and extensive grove. I could not help thinking, as I interviewed this poor wood chopper struggling in the wilderness of bamboos all by

Whether it is palm wine or any other kind, the African is for it.

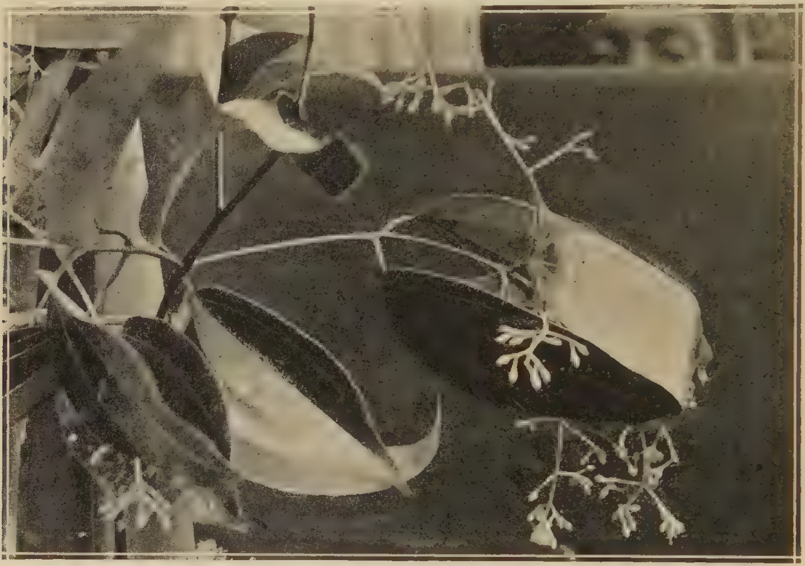
himself, of how slowly the use of a new material comes into popularity. I could even imagine that this fellow had to stand the scoffings and ridicule of his more conservative neighbors, who preferred their mud houses made of crooked but hardier timbers, to the flimsy structures of this pioneer bamboo worker. I must confess the technique was mighty poor, judging from the attempts at fences and houses that I later observed in this part of the Gold Coast.

We entered the tastefully planted Experiment Station of Assuansi late in the afternoon and found Mr. J. Steele, its manager, waiting for us. There was just time to walk out through the royal palms and down into the mango orchard before the crimson glow of the sunset faded away. As we were discussing the comparative quality of the Number 11 and other West Indian mangos with the finer East Indian sorts, none of which Mr. Steele had, an enormous black ant ran across the path. I had been conscious of a vile odor in the air, and when I stooped with my pincers to pick this giant up, I found that the odor came from its body. It was the so-called "Fourmie de Cadavre" or Corpse Ant which I had heard of, but not seen, in French Guinea. It was the most powerful smelling thing of its size imaginable, and far outdid the Javanese Walang Sangit bug in the penetrating character of its nauseous odor. I had missed Wheeler and Graham all through the trip, but never more than when this member of their fraternity crossed my path.

We spent the following morning going through the interesting experimental plots of the Station. I found that Mr. Steele was inclined to think, as does Sir Harry Johnston, and August Chevalier, that the large bamboo in West Africa is an introduced species, *Bambusa vulgaris,* brought over from the West Indies. It seems a great pity that so worthless a species should have been brought in, and no attention whatever paid to the useful Oriental species of *Gigantochloa.* I have never seen anything but the crudest things made of the *Bambusa vulgaris.*

A cathedral-like scene in a forest of the "Krampor" bamboo on the Gold Coast.

As we were looking at a block of camphor trees my attention was drawn to some remarkable nests built by a vicious stinging ant out of four of the leathery shining leaves of this tree. Everywhere in the tropics one sees nests of leaves made by different species of stinging ants, but I cannot imagine one more perfect in its architectural simplicity than this one of the Gold Coast. It is curious that it should have adopted the leaves of a recently introduced Asiatic tree, and one moreover, containing camphor, to which almost all insects object.



A species of stinging ant had made the most perfect nest imaginable out of four leaves of the camphor tree.

On the way down from Assuansi, which lies in the foothills, we passed for the first time what Dalziel calls the "poached egg" tree (*Caloncoba brevipez*). While I must admit that its large white flowers with their golden centers made up of stamens could be compared to the conventional poached egg, I maintain that it does the tree an injustice to make this comparison. Until I see what one of these trees will do under cultivation I refuse to put it on the breakfast menu as Dalziel does.

Quite unexpectedly and just as we were discussing this poached egg tree, the car came into a clearing in the dense forest and stopped. We found ourselves in a strictly feminine market—not a man was to be seen, only about 500 gesticulating, bartering, chattering women, most of them decolletées to the waist. Neither McKinney nor I had been in such a place before and we instinctively reached for our cameras, but with the first appearance of the black "Icas" there was a screech and a wild waving of arms and a rush toward the forest. An explanation that our cameras were not guns brought them back to their produce, and a fringe of the women near the road stood for us to photograph them. It was a hot day and the perspiration was running over my face, so I got out my great pink and white handkerchief and mopped my face and the top of my white head. As I did so I looked up and found that I was being stared at by a row of women and by one in particular upon whose face was such an unmistakable look of disgust that I felt it. I became suddenly conscious of the diseased, unhealthy look a white face must have to people accustomed all their lives to the rich brown tones of the negro, and how ridiculous and unsuitable my goggles, my baggy clothes,

Upon this woman's face was a look of disgust at the sight of the bleached-out, goggle-eyed, white-haired American who was taking her photograph.

and my mushroom hat must have seemed, compared to the simplicity of their men's attire. I have faced girl graduates, I have addressed Women's Garden Clubs and I have walked into fashionable hotel lobbies where the women stare at you as a matter of course, but never before had I been so self-conscious as I was when those bronze-busted women of the Gold Coast looked me down and put me in my place. Later when I visited the concrete market stalls in Secundi with their geometrical designs and general ugliness of outline, I wondered what the reaction of such women must be to them, and whether they did not prefer the great fallen buttressed tree trunks and the tangled lianas of their marketplace in the jungle.

We came down to the coast again and stopped for a look at Cape Coast Castle, one of the historical battlegrounds of the continental wars between the early colonists. It never seemed quite reasonable to me that on these shores, inhabited by millions of black men, a mere handful of whites should fight each other for the possession of the land, and that these forts were the historical monuments of the struggles, chiefly of the whites among themselves.

We called on the Provincial Commissioner of Cape Coast in his white office building near the shore and I noticed in front of his building a beautiful specimen of the *Ficus platyphylla* with enormous leaves and a shade that one would love to lie under. On the ground were hundreds of decaying figs. Did they have seeds in them, I wondered, and as the only way to determine is to examine the interior of the fruits with a lens, I did so. Commissioner Atterbury, an old friend of Dalziel's, became interested and before I left I had a souvenir both of the Commissioner and his tree, a photograph of Mr. Atterbury, and hundreds of splendid seeds, which are growing as fast as they can and will some day provide shade for me to lie under on the coast of Florida.

The haunted castle of Elmina soon came into sight, a really

Above—Commissioner Atterbury, of Cape Coast, seated under the *Ficus platyphylla* tree before his door.

Below—One of hundreds of young trees of the *Ficus platyphylla* now growing in South Florida, giving promise of becoming handsome shade trees there. These all grew from the seeds collected under the tree in front of the Commissioner's Office at Cape Coast.

picturesque piece of architecture, with a romantic setting on a point of land jutting out into the sea and with coconut palms as sentinels. It marks the spot where Europeans first landed on the Gold Coast and was "built by the French in 1383, rebuilt by the Portuguese in 1541, captured by the Dutch about 1638 and handed to the English by its last owners in 1867," as Macdonald remarks in his "Gold Coast, Past and Present" (p. 155). In those days it was a real gold coast, for early in the 18th century the annual export of gold from this port had a value of nearly two million pounds sterling.

Elmina Castle on the Gold Coast over which the Europeans fought long before America was discovered. On the shore I collected the seeds of a pretty shrub (*Eugenia coronata*), which has already grown and fruited in South Florida.

As I stood looking at this castle across the bay, built half a thousand years ago, a hundred years before America was discovered, I looked down at the vegetation at my feet and was brought back to my job, for there in the sand, with the salt spray sweeping over it and the tropical sun pouring down on it, I saw a handsome shrub, covering the sand with its bushy growth and bearing small pink berries which the natives who had gathered around me said were edible. It was *Eugenia coronata*, Schum & Thonn., a strand-loving tree, which, when whipped by the salt breezes becomes almost a shrub, lying prostrate on the sand. I did the best I could, but all the fruits I could find were less than half a dozen. For some time I was afraid to ask how these had grown, for when last I saw the tiny little seedlings in their pots in Chapman Field, they seemed so weak and puny. However, they have grown well, and halfway round the world, on the shores of Florida, may make the same attractive cover for the sand that they have done for centuries about Elmina Castle.

The yacht was snugly anchored behind the still unfinished mole in Takarade harbor and we were glad to get on board again. The booty was not perhaps so great as we had thought it might be, but if a single species which we secured should succeed it might be worth the trip. Perhaps some of Dalziel's plants or McKinney's viruses or even Schultz's photographs may interest some one to make another and a fuller study of this ancient coastal strip of Africa.

The yacht's company had motored to Elmina Castle and were steeped in its ancient history on the one hand, and on the other filled with enthusiasm over the only properly made harbor on the African coast. It was only because we four from the motor trip were in the majority that we dominated the table conversation and focused it on plants, from which subject I must confess to my fellow botanists it sometimes drifted far afield.

CHAPTER LXI

THE FOUTA DJALLON MOUNTAINS

We might have returned to Fernando Po for another look at it but from what we had learned during our stay at Konakry and what Dalziel knew of the region, we chose instead, a few days in the Fouta Djallon, the mountains of French Guinea. There was a railroad that would take us up into the mountains as far as Mamou, near which town many years ago the French botanist August Chevalier had established a small arboretum.

As soon as we landed at Konakry we called on Monsieur Brossart, the Director of Agriculture, who told us that at Mamou there was a so-called buffet or hotel and from there we could go up easily by auto as far as Dalaba, where the Chief Oumarou would put us up for the night in one of his many huts. It was now the ninth of March and still the dry season, but since it is characteristic of the vegetation of the laterite hills of West Africa that many of the plants do not wait for the rains before blooming, we thought we might see some rare flowering shrubs in bloom on the Fouta Djallon Range, which is the highest in this part of Africa. We should have liked to visit the unique Institut Pasteur at Kindia, where some of the interesting work with monkeys is being carried on, and from which immunizing serums are imported into France for the treatment of tuberculosis, but we could not find the time.

It was pleasant to see a hotel again after being at seven ports which had none, and while the one at Konakry could not be classed as first-rate, the cooking had a French character to it and there were wines and fruits and excellent mangos from the proprietor's own garden.

The little train on the narrow-gauge road left Konakry as soon as it was light and took us through the low country and slowly up into the mountains. Mamou lies 2200 feet above sea level and Dalaba 4550 feet. At Kolenté, where the train stopped for a brief pause, the station platform and the tracks had been planted with mango trees. The fruit was ripening; it was a pretty sight and took me back to my own Haden mango trees in Florida.

The escarpments above Kindia, the Santa Valley, the small but picturesque waterfalls that we saw in the distance, convinced us that this was indeed an attractive mountain region. At the stations the black belles of the town paraded up and down. Boys walked by, carrying great calabashes carefully on their heads, calabashes so perfect in shape and so enormous that I wanted to get the seeds of them to grow in my own garden. At one station I saw a real fight, the first one I had seen since leaving America, and while the sum involved in the dispute was less than three American cents, the principle was the same, and the spectators took the same interest that they do everywhere. I have not found that the darky in his native land is at all a quarrelsome fellow.

The so-called buffet was kept by a retired French official and was maintained for officials and officers and such few travelers as pass over the road to the interior. There was not much to eat and as we wandered to our bungalows in the moonlight to make ourselves as comfortable as possible, I was conscious that we were nearing the outskirts of the French civilization in Guinea.

I engaged a Ford car easily enough, and the next morning it appeared at the door. It had a broken rear wheel patched up with boards, no floor in front, and when the engine started up, enough electricity escaped to cover it with sparks; however, the chauffeur spoke fair French and knew the road to Dalaba.

From our own larder we took a rather sketchy lunch along, with such water as we could get and started up the mountain. It was a beautiful day and the morning was cool and fresh and every plant had a new interest. We had not gone far before here and there on the hillsides appeared low bushy trees, leafless but adorned with hanging clusters of golden flowers like those which weigh down the branches of the golden-shower tree in Florida or the laburnum in England. The chauffeur called them "Sinjahi" trees and seemed quite interested in their beauty, and Dalziel recognized them as small specimens of the *Cassia siberiana*, a species widely distributed in West Africa. At first I quite despaired of finding any seeds, but luckily discovered a single tree on which a number of the long black cylindrical pods were hanging, and from these I got a lot of seeds that now are growing in America. Whether this form from the laterite soils of the Fouta Djallon will grow better or not so well as other forms of this same species which have been brought in, remains to be seen.

The hillsides were dry and composed of the same kind of laterite soil that I had first seen in Iron Stone Ridge in the Gambia. It was so hard and so sharp that it seemed as though it must tear our shoes to pieces, yet from this bone dry soil such shrubs as the *Gardenia tenuifolia* and trees like *Syzigium owariensis* and *Parinarium* and *Sakersia* were in bloom. The two principal grasses, dried up at this season, seemed to be the *Eragrostis tremula* and the *Pennisetum setosum*, both of which, according to Monsieur Brossart, are eaten by the cattle.

The bushes were often covered with one or another of several species of combretum, most of them not in flower however, so that I seldom got a glimpse of their beauty. I had seen enough of the genus however to make me want to collect all of the species I could find. In Las Palmas, I had seen the wall of the garden back of the Bishop's Palace covered with *Combretum grandiflorum* and it made a beautiful sight.

We pushed on, collecting as we went, paying little heed to the fact that the hours were slipping along. We counted on a cordial reception by the Chief Oumarou, but when we drove down from the hill into the compound surrounding his picturesque grass-thatched huts and were kept waiting for half an hour and then were received with great formality by Oumarou in spotless white linen, I knew that our telegram must have miscarried, and when we asked for quarters for the night he gave us plainly to understand that he had no beds. It is true that after the day's scramble in the heat and dirt we looked like anything but the dignitaries of a foreign government. I caught a glimpse of myself in the European mirror hanging in his little parlor and must say that I myself would have hesitated to give lodgings to a stranger with such dirty clothes. We walked around through the Chief's village and from his headman, who spoke French, I found out that Chevalier's so-called Arboretum was some half-mile from the compound, but that there were in the compound certain trees which Chevalier had ordered planted. Among these I saw a European pear tree in fine condition.

One of the combretums of the Fouta Djallon mountains of French Guinea. The seeds were collected from the wild plants on the hillside beside the trail in February, 1927, and the plant in a patio in Coconut Grove was photographed in July, 1929.

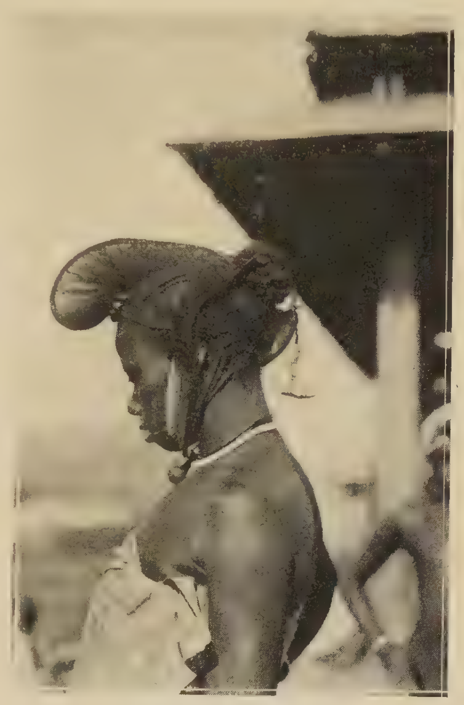
It was the hour of prayer and in the clean-swept courtyard a number of the Mohammedan Chief's people were kneeling, much to the excitement of McKinney who had never seen the impressive ceremony before. Coffee was being prepared and this took some time and gave us a chance to see Oumarou's establishment. There was a neatness about the grass huts and a tidiness about the servants that quite pleased us, and made us regret that we could not spend the night there. Several women in fantastic headdresses, with large shells pendant from their chignons, walked across the courtyard and were pointed out as the chief's wives. The women of Dalaba are noted as the most stylish of the whole region, we were told.

Chief Oumarou standing beside the European pear tree that had been planted under the direction of August Chevalier, the French explorer of the Fouta Djallon mountains.

I was tired and horribly thirsty, yet afraid to drink the water of the village for fear of the amœbæ that so often infest the waters of West Africa, and was grateful enough for the small cup of coffee that the Chief offered us.

In the back part of the compound, some distance away, there was a flowering vine of some sort and naturally our gaze was riveted on it, for we had seen no such vine anywhere and I could not imagine what it was. Dalziel thought it might easily be his pet strophanthus, and while I determined to go and see Chevalier's arboretum he chose to stay in the compound and see what the vine was. McKinney was keen to get some photographs of the village. The Chief's interpreter took me down into the valley and showed me some European pines and a small collection of trees and shrubs suffering from the handicap of too close planting and most of them without labels of any kind. I was so completely fagged out and horribly thirsty and the sun was getting so low that my brain did not take in what really was there. I had only the general impression that there was nothing very distinctive in the collection. By the time we started back I began to wonder if I could make the hill, and my thirst became really painful, so painful indeed that when I did reach the Chief's quarters I could not restrain myself from drinking his turbid water, regardless of consequences.

There was no other way out of it, we should have to get back to Mamou that evening unless, by chance, the missionaries of the American Christian Alliance, who had some very stylish looking grass huts perched up on the hillside, would take us in. We bid adieu to the inhospitable old Chief and motored back up the slope, where we met one of the missionaries but he told us that the resthouses were all full, as this was the vacation season and they were always crowded at that time.


Elaborate headdress of a Fulla woman of the Fouta Djallon mountains.

To add to our embarrassment McKinney had discovered that our car was without lights of any kind, and its patched-up hind wheel was in a very precarious condition. Here we were, twenty-five kilometres from Mamou on a winding mountain road; it was already dusk and the moon would not rise before ten. The chauffeur claimed to know the way well, and had no hesitation in saying he could drive it in the dark, and besides there was no alternative, so we started back. Just as the last daylight faded, on a hill overlooking the valley and in sight of distant mountains, the hind wheel gave out and had to be patched up, and while we were waiting we saw in the fading daylight the powder-puff seedballs of *Clematis grandiflora* in great numbers on some vines on the hillside. This was our last glimpse of the real highlands of the Fouta Djallon, and stupidly, with that procrastination that comes when one gets tired, I had neglected to take photographs of the distant mountains on the way up, and so to Dalziel's especial disgust missed them entirely.

The ride in that rickety old Ford, in a darkness which was sufficient to hide the road right ahead for me, but in which the native driver wanted to go twenty miles an hour, I shall never forget. As we passed through the small villages the chauffeur's friends crowded around him in the darkness, and in one village we succeeded in getting some very fair oranges with which we quenched our thirst. Just as we were congratulating ourselves that we had practically reached Mamou, the gas gave out, so we all got out, enlisted the aid of a number of darkies who happened to come along and pushed the car over a divide down which we coasted into Mamou. Of course the "buffet" was closed and we could get nothing to eat, although a couple of bottles of beer sufficed to slake our thirst and we tumbled into our beds, only too glad to be there.

In the middle of the night I was awakened by a bright light on the wall and the sound of shooting and the wails of native women. In my sleepiness I could not imagine what was happening, and the bewilderment of those moments I shall never forget. I got to the window at last and saw that apparently the whole native village was in flames. The shots, I figured out, must be the exploding canes of the bamboo rafters, and the wailings those of the women and children. As I stood there in the moonlight, I realized as I never had before, that while fire has made a kind of agriculture possible for the native of the jungle, it has brought with it his greatest danger. Imagine trying to stop a fire in a village of grass-thatched huts with nothing to carry water in but a few wash basins and calabashes, while often, as in this case, there would be no water, for it was the dry season. The next morning I looked out of that same window expecting to find the whole village gone, but I learned to my surprise that only a hut or two had been burned. So does one's imagination build fantastic visions in the night in strange surroundings.

The next morning we were determined not to try our fate with the old wreck of a car and I went out in search of a better one. My search landed me finally in the office of the officer in command of the region who was very civil and polite, but, shrugging his shoulders, he explained that there were only two Fords in commission in the town, that he had one and I had the other, and that the urgency of his business made it impossible for him to let me have his. So we started off again in the one of the night before. We spent the whole day on the laterite hillsides, sometimes scattered from each other, sometimes in pairs. I shall always remember the strangeness of the hard rock-like laterite soil from which the pretty perennial *Dissotis grandiflora,* one of the Melastomaceæ, sent up its flower stalk and spread out its handsome purple flower. Other botanical curiosities were an undetermined bush which could only be called the caterpillar bush, because its pods looked more like the caterpillars that had stripped the branches of their leaves than any species of Scorpiurus ever did, and the *Afzelia africana* tree from which we gathered all the pods, fingering each handsome shiny black seed with its brilliant orange waxy arillus as we took it out.

We found a single tree of the lovely *Monodora tenuifolia* with its orchid-like yellow flowers in bloom and searched every inch of the ground beneath it to see if by chance there might not be some seeds, and finally in despair dug up some roots which seemed to have buds on them. To our great delight we did find plenty of ripe pods of *Strophanthus sarmentosus,* as well as great branches in full bloom. A lovely glossy-leaved shrub with brilliant sky-blue flowers in clusters was the *Mamecylon spathandra.* And *Apodytes beninensis,* with its pretty red berries, also attracted my attention and I hope it will grow at home. The small tree of *Bombax buonopozense,* that McKinney found, and which we stripped of every pod, reminded me of dwarf trees of the Malabar species, and I shall be surprised if it does not prove a dooryard tree throughout the southern part of the Florida Peninsula. Of that beautiful tree, *Parkia roxburghii,* named after Mungo Park, the first white explorer to penetrate the wilds of West Africa, in 1795, we failed to find a single ripe seed. Its hanging balls of red flowers are one of the most striking features of West African landscapes.

I wandered off some distance on the mountains, and as it was boiling hot I stopped to rest beneath a spreading ficus tree. I heard a chatter of birds in the branches above me and pretty soon the fragments of a large wild fig came tumbling down. The birds had found a fruit tree for me and I collected all the fruits I needed. They were 1½ inches in diameter, perfectly smooth, and quite juicy, and the Fullahs, as the natives here are called, eat them with milk and declare they are delicious. I did not find them very sweet, but believe they might be a valuable stock to try the fig on. Dalziel declares it belongs to the great hodgepodge species called *Ficus capensis,* Thunb. which is supposed to be scattered all over Africa. A tree has already fruited in the Chapman Field garden in Florida.

We lunched beside a curious field of what the Fullahs called cattle rice, "Diatamara," and cattle were feeding on it at the time. As we tried to walk on it we sank over our ankles in the water and mud. Whether from close browsing or not I do not know, but the field presented the appearance of a level pasture. The plant was a soft and very succulent creeping rush, making a perfect mat with its intermingling stems. At first its substance seemed too little to make it appear valuable as a forage crop, but the more I thought of the way it had crowded other grasses and water plants out and the way it was being eaten by the cattle, the more I wanted to take some home and try it in the Everglades. It is probably *Scirpus supinus*, L., although that remains to be determined.

How often as I was making my way through the brush on the Fouta Djallon, I thought of August Chevalier, whom I had met repeatedly in Paris, and of the years of exploration he had spent with his associates in just such vegetation as we were traveling through. As I write of this, our last day of collecting in West Africa, I can do no better than to quote in full his charming little note of memorium to his *collaborateurs et compagnons d'exploration à travers la grande brousse soudanaise, dans l'immense forêt vièrge africaine, sur les plateaux et les çimes guineennes brumeuses: qui gouterent la joie de fouler des terres inexplorées et de découvrir des végétaux et des animaux inconnus, se dévouant jusqu'au sacrifice pour soulever un coin du voile de la mysterieuse Afrique.*[1]

When we got back to the "buffet" the manager informed us there was a water famine on and that he could not provide water for washing purposes in the morning, although perhaps the boy, his factotum, could find a pitcherful somewhere for us.

Of the dinner I would not speak at all, were it not to give a picture of the rough life in these outskirts of French civilization in West Africa. Although we had waited hungrily for at least two hours, when it did arrive, none of us could eat it. Beside me sat a delicate French woman just out of the hospital and hardly able to drag herself around, yet taking her baby with her to join

[1] Exploration Botanique de l'Afrique Occidentale française.

her husband in the interior. The baby was a badly behaved boy who screamed all the time and finally got bitten by the dog that was crawling around our feet below the table. An Armenian woman sat opposite me and next to her was a British traveling man who had come overland from Dakkar. At a side table sat some French officers who took their turn with us to be waited on by the one servant of the place, a stupid colored fellow who evidently was chambermaid, cook, waiter and everything else. It was the worst cooked, worst served, most unsatisfactory dinner that I ever had in all my travels. The manager explained that he was tied down by the fact that he had to furnish accommodations to officers for almost nothing, and I do believe he did the best he could.

Next morning I found that, true to his promise, the factotum had provided the water for the wash basins, but as I poured some of it out, there flowed with the water a swarm of black specks which in the dim light of the room I took for dead flies, but which on closer observation all turned out to be the liveliest, blackest little tadpoles I ever saw. I had not time to find out where he got the water, but it would not be hard to guess.

We had as fellow passenger on the train down to Konakry, a Monsieur Chabanes la Police, who had come down from France to look after his pineapple plantation, and from him I learned that there are just the same difficulties and perhaps more, connected with pioneering in French Guinea that there are elsewhere in the tropics. My chat with him served to strengthen my conviction that large capital and an organization large enough to handle the insect and fungus enemies of the plants will come to be recognized as the *sine qua non* of successful tropical agriculture.

When we got back to the yacht we found that Mr. Armour had been entertaining the distinguished French scientist Dr. Suzor, and that the Doctor had given him some nuts of the "Noix de Cayenne" that had grown on a recently introduced tree in one of the gardens. The nuts were produced in large fruits somewhat resembling the pods of the kapok, and were of excellent quality, suitable for the table in every respect. Although this species appears to be a West Indian or Amazonian *Pachira*, of which genus we have two species growing in Florida as ornamentals, the possibilities of the Noix de Cayenne had never before been brought to my attention, and it seemed as though I had come upon it in a very round-about way.

CHAPTER XLII

FROM DAKKAR TO MALAGA

Two days' run from the busy, attractive little port of Konakry and we were back in civilization, at least of a kind, at Dakkar, with the cafés and restaurants and taxis and shops which characterize French civilization wherever it has spread. The docks were piled mountain high with peanuts in bags ready for shipment and there was a look of business prosperity about the whole place. It even possessed a little nursery where trees and shrubs were propagated for the city streets and open spaces. Back of the town stood a natural grove of immense baobab trees and there were the usual market gardens that always cluster around a new city. From Dakkar the airplanes made through trips to Morocco and carried mail more or less regularly when they did not have a "panne" and land in the Rio de Oro region and be chopped to pieces by the savages there. Two aviators had lost their lives in this way shortly before we landed.

At the American Consulate where we went to call, I was much surprised to meet an old acquaintance with whom I had been associated in the first days of the date introduction work in Arizona, Dr. R. A. Forbes, just in from five years in Senegal in the employ of a French concern interested in the growing of cotton near Lake Chad. He felt optimistic about the prospects there and had many stories to tell of his long sojourn in the interior of Africa. He gave me some seeds of a remarkable sorghum called "Gibi" that is grown in the Lake Faguibine Basin, eighty kilometres west of Timbuctu, where he believes the conditions are similar to those in the neighborhood of the Salton Sea. Two crops of it are grown, and the second one has to be harvested from boats.

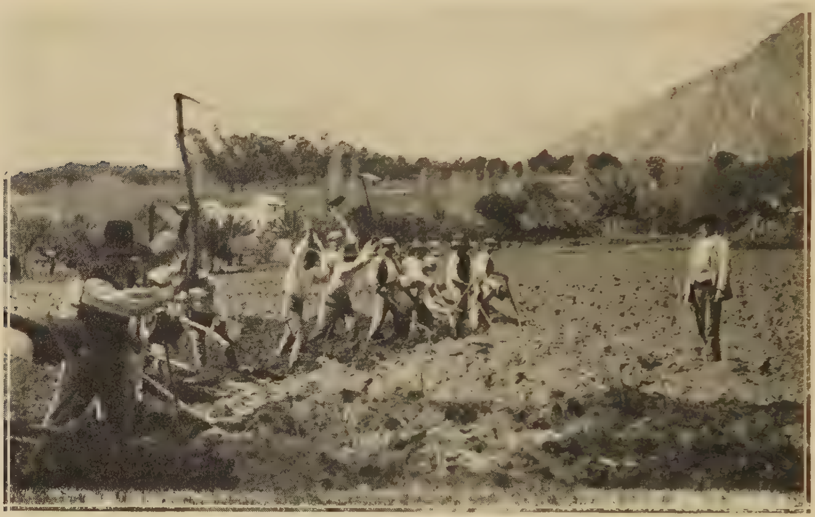
Up to the time we left Konakry everybody on board had been well, but McKinney came down with a fever shortly after the Fouta Djallon trip and for some time kept us guessing what the trouble was. There was scant evidence that it was caused by a malarial parasite and later events, resulting in an operation for appendicitis, still further cloud the diagnosis.

On the 17th of March, off the coast of Senegal, we passed the curious abandoned island of Goree, which was one of the first places on the coast to be inhabited, but which to-day is covered with deserted houses. As it faded into a line on the horizon we stood on deck and strained our eyes to see the last of the great continent.

Three days in Grand Canary gave me a chance to see how beautiful the terraced barrancos are in early spring and to see how tall the tedera grows at that season, and how rank the medicagos are in the moister places. McKinney too was strong enough to collect more diseased *Nicotiana glauca* plants for his studies and we all prepared for the coming Mediterranean environment.

As we approached Gibraltar, where Mr. Armour found that several days would be required for certain readjustments, the Whitehouses invited me to make a short run with them along the coast to Malaga to see with our own eyes what I knew was there, a century-old avocado tree growing in the garden of the Marquis de Paniega. The last time I had visited Malaga was in the late summer of 1901 when I was investigating the almonds of the dry Sierras back of the town. I knew of it as the warmest, most sheltered spot on the whole Mediterranean coast, where even the chrimoya grows and bears fruit. When the car shot out past the great Rock of Gibraltar toward San Roque and we saw before us a sea of golden Spanish broom (*Genista scorpius*) that stretched to the horizon, and smelled the cool air of a Mediterranean spring, our spirits rose and we felt that we three were off for a real lark. It may be that somewhere in the world there are just as wonderful arrays of broom as here in southern Spain, but if there are I have never heard of them and cannot imagine them.

Beside the road in the grassy ditches and on the beaches, back where the waves could not reach them, grew thousands of the delicate and very beautiful dwarf *Iris sisyrinchium.* Though I knew it was taking a long chance, yet I was keen to see the species naturalized somewhere on the Pacific coast, so I got out the "piosche" and we spent a busy half-hour digging them.



"Plowing" a field for wheat in Southeastern Spain with the same technique that seemed to me old fashioned when I saw it thirty years ago.

Just as we arrived on the outskirts of Malaga we passed a scene that I had been waiting for, a mattock gang at work digging over a field preparatory to planting wheat. My reasons for wanting a photograph of this process were simply these: when I was in Southeastern Spain, in 1901, I stated in a letter to the Secretary of Agriculture, that in matters of agricultural machinery the Spanish farmers were so far behind that they could not catch up with the Western World. For this rash statement, which came to the attention of the then Ambassador from Spain, the Secretary, who had ordered the letters published, had been taken sharply to task, and when I landed I was soon told of the affair and expected a curtain lecture, but Secretary Wilson merely smiled and said, "I guess you were probably right, Fairchild." It was rather a grim satisfaction after the lapse of more than a quarter of a century to find here in the same region the same prodigal use of human muscle and back-breaking labor in turning up the ground, taking the place not only of the horse-drawn gangplow we were using in America at the time of my first visit to Spain but the tractor-drawn tools of to-day. The world of the machine had gone by unnoticed and Southeastern Spain has not caught up, in fact it seemed farther in the rear than it was before.

An avocado tree in the garden of the Marquis de Paniega, near Malaga, although a hundred years old, is still a new fruit tree in Spain.

The markets of Malaga were full of spring vegetables and winter ones as well. The street vendors were selling their oranges, tomatoes, leeks, onions and broad beans and I observed among them some fine large cardoons and thought what a pity it is that so delicate a vegetable should be so little known on our American markets.

We had no difficulty in finding the country place of the Marquis de Paniega at Churiana, but, although we tried our best and I haunted his favorite café, we never met the Marquis, although he sent word that we were welcome to his garden where the avocado grew. There it was, as large, or even larger, than any avocado tree I know of in America. It was planted just fifty years after the signing of the Declaration of Independence. In these years the United States has become the great market for the produce of Malaga, over a million dollars coming in every year for their almonds alone, and yet the thought seems never to have come to anyone to plant the avocado as an orchard fruit even though this pioneer has borne in a single year as many as 800 fruits the size of one's fist and of good quality. I had expected this tree to have the anise-scented leaves that characterize the hardy Mexican race of this species, but it has no such scent and evidently belongs to the true West Indian type, and is, in fact, said to have come originally from the Island of Cuba. Twenty years ago the Marquis appears to have planted a seed from the old tree, for standing a hundred feet away is a tree of about this age which Gonzales, the gardener, avers has had fruit on it like the mother tree. As evidence of increasing interest in the avocado he showed us several dozen small seedlings, a year or so old, in the back of the garden.

On questioning Gonzales as to where there were other avocado trees he directed us to the Finca La Aurora where there were five trees of the West Indian type, one of which, although thirty years old, has never borne fruit, although it flowers at the same time and stands close to another tree which bears well. According to recent researches many varieties are self-sterile and if their flower pistils are not receptive when the pollen of neighboring flowers is ripe, they remain barren. The failure of this particular tree to fruit may be due to this cause.

Besides the trees in these two gardens we discovered in the charming garden "Retiro" at Churiana, some mile or more away, an avocado tree of the Mexican type with distinctly anise-scented leaves and with what the gardener called "thin - skinned" fruits. I should say this was also about thirty years old. These were all the trees I could hear of in the entire region, and one might be disposed to compare the progress made by the Cameroon blacks in the adoption of the avocado with the lack of progress in Southeastern Spain. There are too many factors in such a comparison for my poor brain to handle and draw a conclusion that sounds entirely reasonable, but the facts are worth recording. Perhaps the existence of 5000 acres of avocado trees in California and Florida will in time indicate the profitableness of this fruit tree to the Spanish and convert some of the sheltered fincas where figs

Mr. and Mrs. Frank Whitehouse, who were so camera shy that they nearly escaped appearing in the book, were at last caught hiding behind the giant Italian cypresses of Retiro, near Malaga.

and vines are grown into fincas of avocados. The lowest temperature recorded for Malaga occurred in 1919-20 when the thermometer went to 27° F., but this is not so low as it goes in California and Florida.

I was greatly surprised to find an immense tree of the American pecan (*Carya pecan*) in Retiro. It must be over a century old and from its twigs were still hanging enough small outer husks to enable me to see that it was a very small fruited seedling. Later I bought a half-pound of these Spanish-grown pecans from a grocer in the town, and they were not more than three-quarters of an inch long, and hard shelled. At Torre Molinas in an old neglected garden we saw another large pecan tree. It seems a pity not to substitute grafted pecans, with their delicious nuts, for these worthless seedlings.[1]

I should like to have visited the orange groves back of Malaga which supplied the markets with very attractive fruit, not graded nor uniform as is the California fruit, but sweet and of good quality. The lemons, too, lacked entirely the uniformity of the California lemons, and one might almost think that there was something about the variation in size and color and other characters that was attractive to the buyers.

The idea of standardizing oranges has not yet come to Spain. Perhaps they don't believe in it, but I am inclined to think they just haven't gotten around to it.

Malaga had changed amazingly since I was there before. I could scarcely find my way about. The suburbs have filled up with expensive villas, and apparently Europeans have at last discovered that it is the warmest spot on the continent and are building in the sunny protected places against the hills. Of course it is not really warm in Malaga in winter, any more than it is in California, for after all it lies in the latitude of Norfolk, but it is warmer than the Riviera.

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[1] Is it possible that somewhere in Spain pecan trees are growing from seeds sent home by the early Spanish explorers of our great Southwest?

When the Whitehouses and I returned from our three delightful days, our Consul, Mr. Sprague, who represents the third generation of Spragues to hold that position in Gibraltar, gave a luncheon to the ship's company. He told us of his country place where he goes every Sunday with his friends, and it was then and there arranged that I should send him Meyer's dry-land elm and a Chinese jujube tree to plant as shade trees in his garden as souvenirs of his long service in the field of plant introduction, for it was he who had sent in barrels of cork-oak acorns that are now growing in many places in California.

CHAPTER XLIII

PORTUGAL AND THE END OF THE CRUISE

I HAD often planned to visit Algarve, the southern province of Portugal, in quest of varieties of the carob tree, but never dreamed that I should some day see its rocky coast from the sea, where the waves of the Atlantic have cut it into narrow bays and inlets and all sorts of grotesque forms. It has a high and rugged coast with whitewashed towns on the plateaux back of it, but with a wind-swept cheerless look that is not inviting. Near Lagos every vessel is warned to keep away from the giant nets set sometimes three miles from the shore to catch the summer run of tuna fish.

We were in the river Tagus in early morning; the fishing boats with their brown Venetian sails were darting back and forth across it, and there was the bustle of commerce that so unmistakably denotes the nearness to a big city. I had landed in Lisbon from Brazil once with Mr. Lathrop, and Mrs. Fairchild and I had once touched at Portugal returning from Madeira, but there were two places that I had always wanted particularly to see, and had never been able to get to, the Monastery Forest at Bussaco into which some rare trees had been brought by the monks, and the famous old University of Coimbra. Then, I was sure that Cintra with its remarkable gardens near by, at Monserrat, must have brought in something new.

My first trip ashore was more dramatic than I had anticipated. McKinney had had a relapse and we were worried about him, so with what little Portuguese my ears remembered, and my Spanish, I set out, late in the evening, to bring a doctor aboard for a consultation. It had not been long since the latest revolution, a really serious affair, quite different from the ordinary uprisings in Lisbon, and here and there tell-tale bullet holes through plate-glass windows and doors were to be seen. Until you have chased around at night in a dimly lighted European town, you will never appreciate that our checkerboard system of streets, ugly as it is, has at least one advantage; you can usually tell whether or not you are going in the right direction. After a revolution, during which even the American Consul stayed strictly indoors, Lisbon seemed a spooky place. I had met our Consul, Stanley Hollis, in East Africa in 1903, where in his garden I had found the Kaffir orange, but I had not expected that the next time I saw him I should haul him out of bed in Lisbon to help me to get a doctor. As I stood looking at him, and recalled him as he was a quarter of a century before, then a beginner in the Consular service, I was conscious in a curious way of how our worlds had changed. He told me where I could find a good Scotch doctor, who came on board and settled our acute worries.

Should anyone decry the use of introduced plants in a garden, let him see the American Washingtonias, the Canary Island Phoenix palms, the African date palms and the Brazilian *Cocos plumosa* in the Botanic Gardens of Lisbon.

As I had surmised, the old Botanic Gardens of Lisbon were more beautiful than ever, and as I walked under the handsome specimen of *Ficus rubiginosa* that guards the entrance, the scene came back and I recalled that when I was there years ago a Frenchman by the name of Cayeux was Director of the Gardens, and from him I had secured the first plants of the rose called "Belle of Portugal," a rose that is now growing up and down the whole California coast. It was his own origination and one of the first hybrids ever made with the giant rose of Burmah (*Rosa gigantea*), as a parent. I looked for the rose but found it nowhere in the garden.

If anyone should wish to see beautiful groups of such hardy palms as the two Washingtonias, *Cocos plumosa, Phœnix canariensis*, and the true date palm, he will find them in the Botanic Gardens at Lisbon, together with a good assortment of other ornamental trees and shrubs, but he should not leave without a visit to that other and much older garden at Ajuda which dates from the time of Queen Mary in 1758.

I went through this one afternoon with Professor Rasteiro from the Instituto de Agronomia which I visited on the hill in the outskirts of Lisbon. I was much impressed with his eagerness to know of all the progress made in American pomology and it seems a strange and incomprehensible thing that men like him should not be sent to see what is going on in California. I really believe ten times as many Japanese students of botany and horticulture reach California as come from these Mediterranean countries of Spain and Portugal. It is rare to find one who has been so far away from home.

As Professor Rastiero was showing me about, we passed an arbor covered with a climbing rose that showed here and there a beautiful pink bloom of quite unusual size and beauty. I asked if it could be the "Belle of Portugal." "Ah! yes, that is it, is it not, Manuel?" he said, and turning, I observed that we were followed by the old gardener of the place, Manuel Fernandez, a man of 84 whose memory reached back far beyond the days when Monsieur Cayeux was in the other garden breeding roses, and with him as guide the garden took on historic interest.

Two date palms, a male and a female as large as any in Egypt, were planted about 1758 or thereabouts but have never produced first-class dates; there is not heat enough. A dwarfed and spreading Dragon's Blood tree, planted about the same time, shows what we may expect from this weird tree in the cooler regions of California. The Til tree of the Canaries of which we had gathered seeds in Grand Canary, was represented by a beautiful specimen 160 years old.

Manuel Fernandez, the 84-year-old keeper of the garden of Ajuda, holding the Belle-of-Portugal rose which was originated by Monsieur Cayeux in the Botanic Garden of Lisbon as a hybrid between a Tea rose and the giant Rose of Burma (*Rosa gigantea*).

Everywhere I went, if I mentioned my mission, I was advised to see Bussaco, so one morning with Mr. Whitehouse as my guide (neither of us having been there before) we set out for Coimbra and Bussaco which lies above it. The weather was what it generally is in April anywhere on the Atlantic coast of Europe, rainy and raw, and we both shivered with the cold in the fireless hotels.

The ancient college of Coimbra has played a signal rôle in the life of Portugal and some day I should like to study what the Portuguese have done to open up the plant treasures of the Orient, but I do not know enough about it to more than mention the matter here. The name of Welwitsch brings to every trained botanist an image of perhaps the weirdest plant that grows, an inhabitant of the West Coast of Africa. If we had crossed the equator and kept on down the coast we should have passed its home. Here in the Botanic Garden of Coimbra rest the dried specimens of this weird uncanny plant, *Welwitchia.* It has no other leaves than the two cotyledons or seed leaves which every dicotyledenous plant has, but unlike those one commonly sees, which wither and fall, they grow on and on for a hundred years, making great broad waving bands of green twelve feet long and as wide as your hand, that lie on the sand on either side of a half-buried hollow trunk.

Mr. Whitehouse and I drove to the gate of the charming old Botanic Garden and the very first tree that greeted us was the beautiful double flowering Japanese cherry tree, the one the Japanese call "Choshu," with deep pink blossoms. I find it strange that a tree so beautiful has been so little used in the gardens of Europe. It must be that it wants more summer heat than Europe affords.

Across the garden great trees of the European red bud or Judas tree (*Cercis siliquastrum*) were blooming and the ground under them was covered with the flowers, reminding me of trees as large and beautiful that bloomed in the old Moorish Palace in Rabat. A splendid giant of a ficus tree which Prof. Borzi, with whom I once studied in Palermo, has named *F. magnolioides,* covers the terrace with its banyan-like, aerial roots, behind which are the conventional conservatories, housing just the sort of plants one would expect to find. I was agreeably surprised to find some active work in plant introduction going on, and growing on the walls of the conservatory was a beautiful vine (*Parthenocissus henryana,* Nob.) with clinging tendrils as perfect as those of the Virginia creeper and extremely decorative, five parted bronze leaves with lighter veins. This is a Central China species named after the great pioneer student of Chinese plants, Augustine Henry. It was brought to Europe in 1905, but I had never seen it before. The Director very generously gave me a plant.

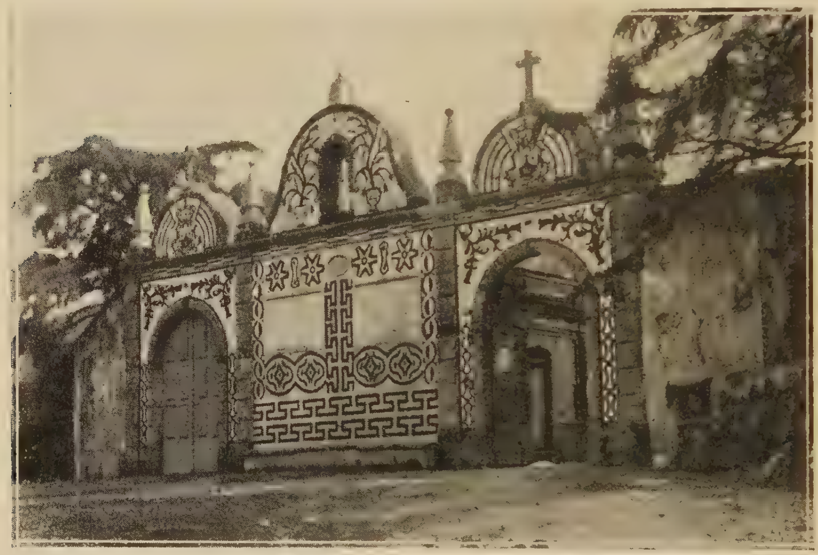
The Forest of Bussaco, which lies a two hours' run from Coimbra up in the hills, owes its character as an Arboretum to Señor Moraes Soares, who for fifteen years, beginning in 1856, amused himself by importing the seeds of different trees from various parts of the world, beginning I believe with the establishment of different forms of Cedrus, the Atlas cedar, the cedar of Lebanon, and the Himalayan deodar. Since its location in the mountains of central Portugal has given Bussaco a mild climate and more rain than in the surrounding lower lands, many species of trees have done unusually well there. The temperature has never been recorded below 27° F. and the spring rains are abundant; 5½ inches for example in March. November to April are the wet months and the spring humidity stands around 85%.

Mr. Whitehouse and I felt keenly that even in April the humidity was greater than we cared to have it, for as we pulled into the little railway station from which one drives to the Palace Hotel of Bussaco it was overcast and chilly. In fact during our stay in Bussaco we never did get warm, for the place is a summer resort and the hotel an old and extremely ornate but cheerless Royal Palace made over into a hostelry.

The young forester, Señor Jose de Melo de Figueiredo, who has charge of the forest, which is now a National one, called upon us and showed us all the interesting sights in the forest and arboretum. There are now eleven hundred acres in the "Bosque de Bussaco" of which only 230 have been planted and 880 are being gradually set to trees. Just when the first exotic trees were planted here, I could not find out, for long before Señor Soares' time it was the site of a large monastery and the monks planted many species that are now represented by trees that would seem to be two hundred years old.

We wandered all day long through the Forest of Bussaco. There was a valley of tree ferns (*Dicksonias* and *Cyatheas*) and a series of ten water basins connected by cascades on the mountain side of the dense forest. The winding paths led off to superb views of the plains below and the Val St. Sylvestre was made beautiful by the planting of Mediterranean pines, oaks, the Atlas cedar and the American ash.

At the Porta Coimbra, which dates back to the time when the place was a monastery, there is a curiously ornate structure of cement and broken rock, and set into the wall of this strange looking portal we observed two marble tablets inscribed in Latin. Although the weather had worn the marble a good deal, two warnings were still legible, warnings which, in the days when they were put up, must have had more effect than any of the signs The Forest Service puts up in our National Forests. How weak are such appeals as "Help Save the Redwoods" or "Help Prevent



Papal Bulls carved in marble on the walls of Bussaco threaten with the horrors of excommunication any person who should cut down a tree in the forest of the Monastery, and any woman who might dare to enter it.

Fires" in comparison with a Papal Bull which threatens with excommunication any person who shall cut down a tree in the Forest of Bussaco? Would that the Pope might extend this Bull of his to take in the marvelous forests of the Western world before they melt into newspapers or go up in smoke!

But the other companion Bull is, I fear, a dead letter in these days, for it threatens to excommunicate any woman who shall have the temerity to set her foot within the confines of the forest.

Mr. Whitehouse and I read what we could of these old Latin Bulls and as we turned away to look down at the little village of Bairrada far below us, we could hardly realize that while these trees around us had been growing from little seeds to the giants that they are now, the attitude of the world had changed so tremendously that the Pope would never even think of making such a regulation to-day.

What makes Bussaco so interesting is the fact that different species of foreign trees have been planted in groups and one sees not merely a specimen tree here and there but a considerable area of, for example, *Eucalyptus regnans* (so-called by Señor Figueiredo) and *Cupressus lusitanica* the Goa cedar. In one forest group we saw together the Japanese *Cryptomeria japonica* and its form *elegans,* the California redwood and giant sequoia with *Picea morinda* from the Himalayas.

The glory of Bussaco, however, lies in the magnificent two centuries' old Portuguese or Goa cedars with great spreading crowns and trunks that remind one somewhat of the trunks of the redwoods. Dr. Rehder told me that it is from these trees that the botanical descriptions of this splendid tree were made. For a long time its place of origin was unknown, but it is now believed by some to have been introduced from the mountain forests of the Portuguese Colony of Goa on the West Coast of the Indian Peninsula by one of the early monks, and from these trees the species has been spread throughout the Mediterranean and is already established here and there in California and Florida.

I admired these Goa cedars so much and took such an interest in Señor Figueiredo's plans for the making of a rather large forest planting of it, that he showed me the beautiful scented timber he had secured from some trees he had felled. Its softness, the straightness of its grain, its beautiful light-brown color and the fact that it was as perfumed as a cedar pencil, made me anxious to find out if we had done anything with this species in America and I was delighted to get from Señor Figueiredo a quantity of fresh seeds. He spoke with pride of the fact that some Australian forester had recently taken twenty pounds of seed with the idea of planting a forest of it in Australia. From what I later saw of the behavior of this species in the Southern States I would not be surprised to eventually see extensive plantings of it there.

A two-century-old tree of the so-called Goa Cypress (*Cupressus lusitanica*) in the Bussaco Forest Station of Portugal. Its beautiful soft fragrant wood has attracted the attention of foresters, and its ability to grow in our Southern States makes it a promising tree for forest experiments.

Of course the whole yacht's company went to Cintra before leaving Portugal. Those dizzy heights down which one looks from the ramparts of La Peña are almost terrifying and it is a pity that the place is not as full of beauty or history as one feels it should be. To my delight I found the gardens of Monserrat being well taken care of again, for when Mrs. Fairchild and I saw them in 1909 they were somewhat neglected. That this gem of a garden is what it is should be attributed I think to the imagination of Sir Francis and Lady Cook and the fact that their successors have shared their love of landscape gardening and knew how to pick good men to plant and care for its rare species.

Aside from the superb fern valley, the magnificent Araucarias and *Seaforthia elegans* and the splendid *Pinus montezumæ*, the tree which pleased me most was a magnificent specimen of *Agathis excelsa* the famous Kauri Pine of New Zealand, for which I have always cherished a peculiar affection ever since seeing it in the North Island of New Zealand, where it was being gradually exterminated. In the Peradeniya Gardens in Ceylon there are two superb specimens of its cousin the *Agathis robusta* of Northern Queensland and I was told there that a forest planting of it was being made in Ceylon.

A gathering rainstorm broke before those of the party who had lagged behind left Monserrat, and we encountered that disagreeable cold drizzling atmosphere which is the trouble with the spring climate of Southern Europe.

The Expedition was now practically at an end; the three days across to Bordeaux were hectic with packing and arrangements for the scattering of the company, for there is always too much of the *sauve qui peut* about the breakup of a party to make it part of the pleasant memory.

We arrived in Bordeaux the thirteenth of April, before the vineyards on the banks of the Gironde were really green, but spring work was in full swing and we could see across the lowlands of the "Medoc" the roofs and walls of Château Lafitte and Château Margaux and that choicest of them all, so far as the wine that comes from it is concerned, the Château Iquem.

The cruise was over. Had it been an ordinary trip there would have been nothing left but fading memories; memories of thrilling days in jungles of Sumatra or of the Tamil civilization of Jaffna, the oases of the Sahara, the souks of Fez, the dank dense wilderness of the Cameroon or the mountains of the Fouta Djallon. I say nothing left but memories, but I suppose I should add, and thousands of photographs pasted in albums and herbarium specimens neatly put away in folders.

But this had been a cruise after living plants, and its end was just a beginning. As I stood on the deck bidding my friends adieu, I was not looking back, for already a flood of anticipation was streaming over me. I had begun to worry and wonder about the thousands of little plants in the Plant Introduction Gardens.

From that time to this the romance of the expeditions has been steadily growing up, for there are mangosteen trees in the orchard at Tela, Honduras, coconut and African oil palms in Panama and Cuba, rock-cover plants in the parks of Seattle, poplars on the bleak prairies of the Dakotas, Moroccan apricots in the orchard regions of California, forage shrubs in the mountains of Arizona, shade trees, timber bamboos, sand dune shrubs, fragrant flowering vines and beautiful strand trees and palms on the coast of Florida—all of them pulling at my heart strings, for one cannot forget where one gathered the handful of seeds from which so much has grown.

The cruise was over, but a whirl of plans for the placing of many thousands of new plant immigrants was upon me as I watched the vineyards pass on the banks of the Gironde.

I have heard it said that if those who start on a long yachting cruise together are on speaking terms at its close the cruise may be said to have been a social success. I recognize that there are perhaps no more trying conditions to test the temper of men and women than those on a boat, but I am sure that I speak for all of the so-called "Utes" of the cruise of 1926-27 when I say they would all be delighted to meet again at any time and any place when the Utowana whistle blows.

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